Agricultural Chemicals

Fertilisers and Manures

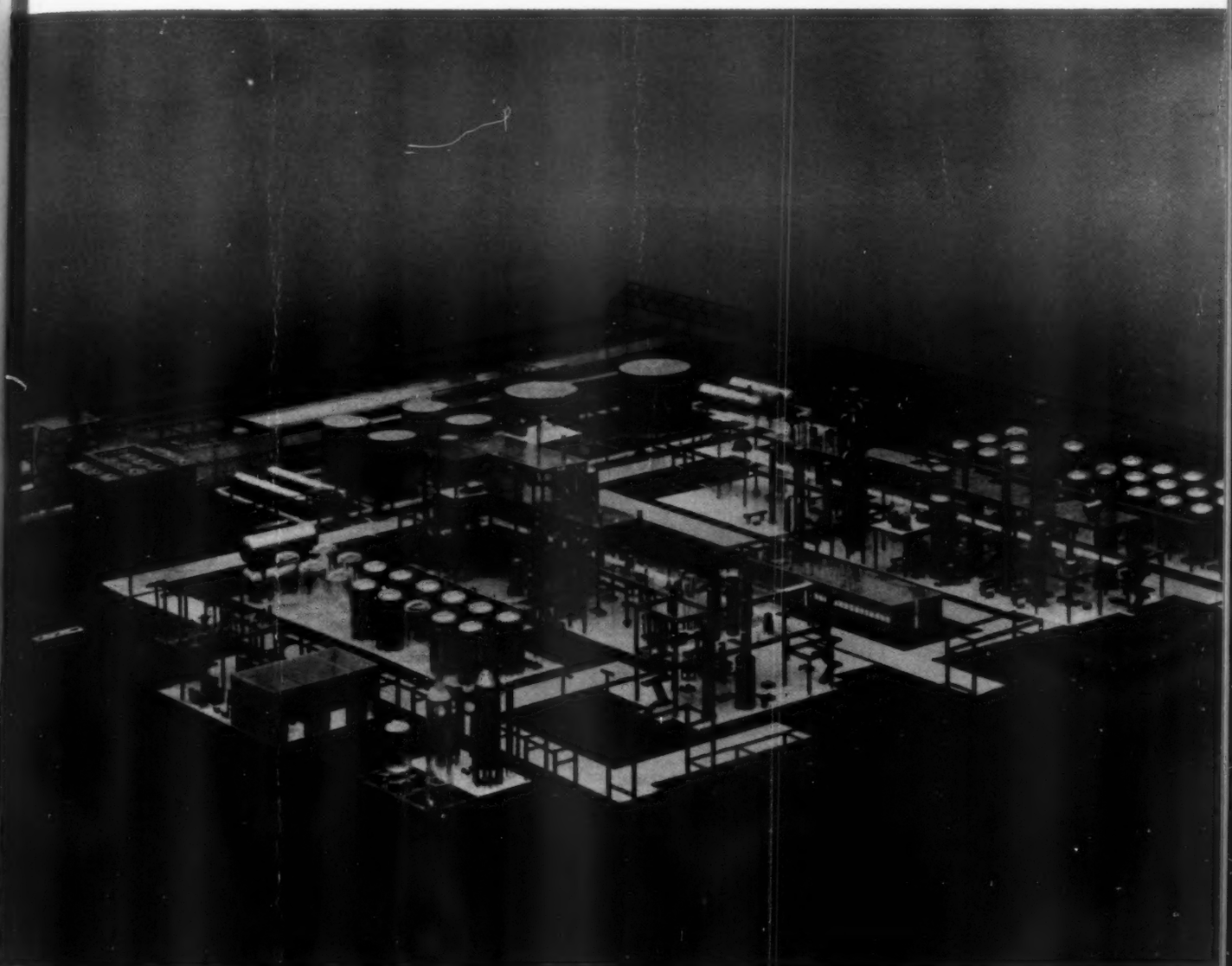
PR

THE UNIVERSITY OF MICHIGAN
FEB 2, 1961

WORLD CROPS

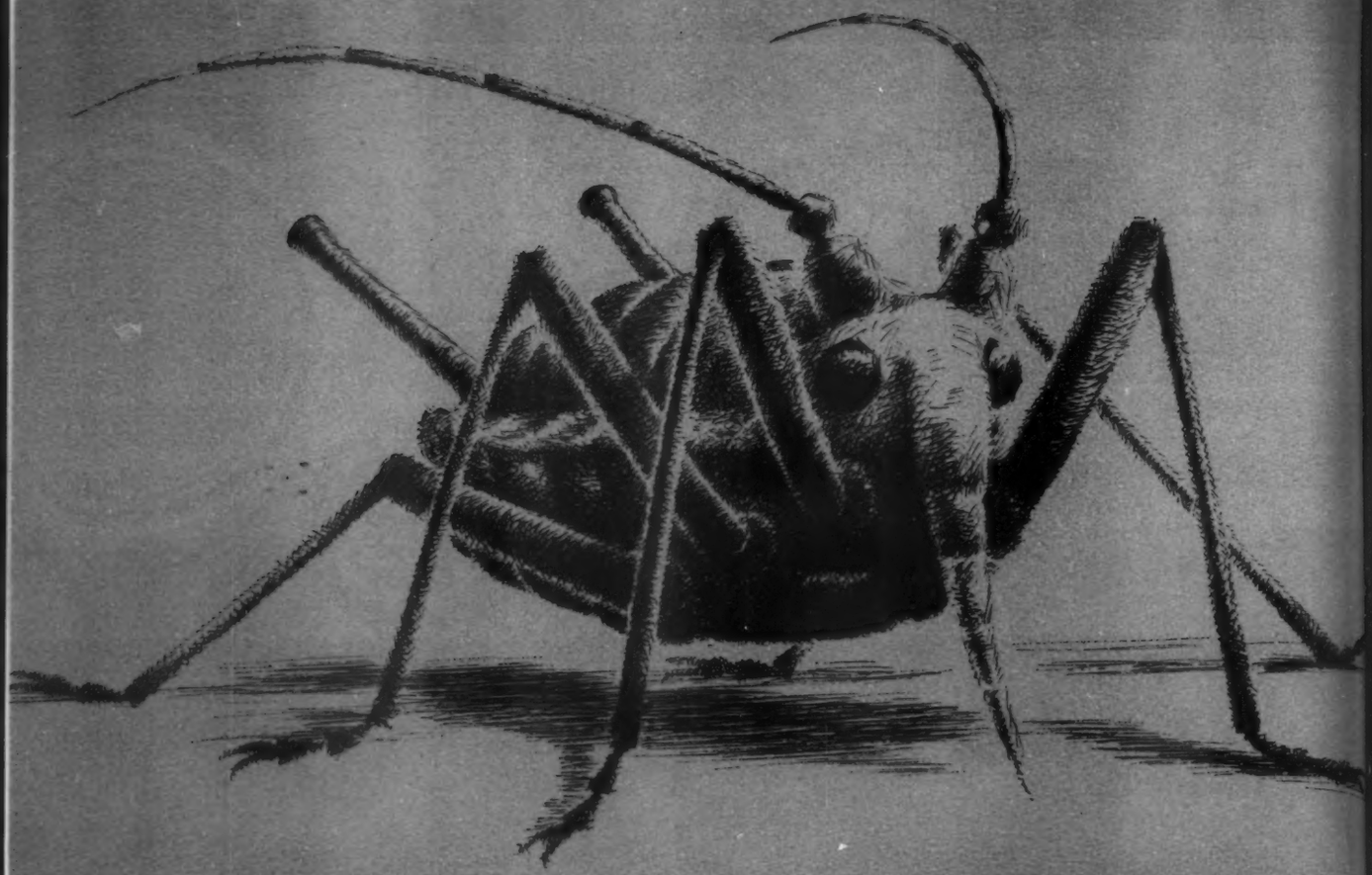
The International Journal of Agriculture

VOLUME 13, No. 2 FEBRUARY 1961



Union Carbide Corporation's new plant producing the world's supply of SEVIN, the latest all-purpose insecticide. *See page 46*

A Publication of The Leonard Hill Technical Group



Feed – feed – feed . . .

the sole occupation of aphids. They occur all over the world in innumerable species, and no crop is safe from their attacks. In favourable conditions, there is no limit to the aphid's rate of multiplication. A single aphid colony is capable of developing into a disastrous plague within a very short time.

The juice of plants is the only food consumed by these parasites, which explains why aphids are to be seen everywhere in large swarms on leaves, stems and blossoms.

By sucking the precious sap from the stem and leaves, these minute pests gradually lower the vitality of the plant which they also poison with their secreted saliva. The aphid is also especially dangerous as a carrier of virus diseases – thus, a pest which inflicts twofold damage.

Research helps the farmer

The danger that threatens crops all over the world from attacks by aphids can never be too highly estimated. Without the products discovered by chemical research, farmers would be helpless in dealing with the problem of aphids.

The epoch-making development of the systemic crop protection products

Systox and Metasystox

has enabled these plagues as well to be suppressed in all parts of the world.

The application of **Folidol** against numerous other insect pests also gives simultaneous control of aphids.

Cupravit, copper spray
Pomarsol, TMTD spray
Folidol, E 605, methyl parathion, ethyl parathion
Metasystox, Systox, systemic insecticides
Dipterex, Gusathion, new type insecticides
Hedonal, herbicide
Tugon, fly killer
Seed dressings of all types for all uses (mercury, hexachlorobenzene, TMTD, COBH)

BAYER

FARBENFABRIKEN BAYER AG LEVERKUSEN/GERMANY

Represented in all countries of the world

Editor:
FRANK COOKE, A.R.C.S., B.SC., A.M.I.CHEM.E., E.D.

Assistant Editor:
PATRICIA JACKSON, B.A.

Research:
D. J. CAMPBELL, M.A., PH.D., A.R.I.C., M.I.INF.SCI., A.L.A.

Advertisement Manager:
MURRAY E. PEVAN, M.S.M.A.

Published by:
The Leonard Hill Technical Group,
Leonard Hill House, Eden Street, London, N.W.1 (Tel.: Euston 5911; Cables: Lenardil, London).

U.S.A.:
501 Fifth Avenue, Room 611, New York, 17; 92 Lorraine Avenue, Upper Montclair, New Jersey (Plaza 5-1127, Pilgrim 4-2484); 332 West Harrison Street, Oak Park Illinois (COLumbus 1-7906); 1501 Euclid Avenue, Room 426, Cleveland 15, Ohio (TOwer 1-2280); 1214 Villa Drive N.E., Atlanta 6, Georgia (Trinity 2-2969); 2515 Beverly Boulevard, Los Angeles 57 (DUnkirk 1-2241); 681 Market Street, San Francisco 5 (Exbrook 2-2612); 121 Ward Parkway, Kansas City, Missouri (Logan 1-3880).

ITALY:
Via Filippo Turati 3, Palazzo Giardino, Milan (639367).

SWEDEN:
Tunnelgate 19b, Stockholm.

Subscription Rates:
1 year, £2; 3 years, £5

© *Leonard Hill Limited*

WORLD CROPS

The International Journal of Agriculture

Vol. 13, No. 2 *February 1961*

EDITORIAL COMMENT 43

SPECIAL ARTICLES

Chilean Agriculture 47
Fertilisers and Food Production 51
World Crops and Overseas Trade 56
Chicle 58
Immature Nutfall of Coconuts 60
Progress in Weed Control—2 63
Use of Lignite in Agriculture 66
Medicinal Plants in Hungary 67

REGULAR FEATURES

Letter to the Editor 69
Coming Events 70
World News 72
New Publications 73
Machinery and Equipment 75
Agricultural Chemicals, Seeds and Supplies 79
World Crop Reports 81

Agricultural Chemicals

For the Farmer . . .

'Ialine'
REGISTERED TRADE MARK

A COMPLETE RANGE OF
INSECTICIDES
FUNGICIDES
SELECTIVE WEED KILLERS
INCLUDING
COLLOIDAL COPPER
COLLOIDAL SULPHUR
BRUSHWOOD KILLERS
2,4-D & MCPA SPRAYS
GRASS GROWTH REGULATOR
2,4-D, MCPA & 2,4,5-T ESTER SPRAYS

AGRICULTURAL DIVISION
BURT BOULTON & HAYWOOD LTD.
BRETTENHAM HOUSE LANCASTER PLACE STRAND LONDON W.C.2

There are drums and drums—both spell war!

African drums are frequently a prelude to war. There's no doubt about the purpose of the drums of Kenya Pyrethrum, now exported to all parts of the world. Pyrethrum is a deadly weapon against insects, with one great advantage—it is completely safe to use.

As insects become immune to some insecticides, new, more toxic killers are devised. These may be more dangerous to humans and animals. Pyrethrum scores in three remarkable ways. Firstly, no insect resistance of any practical significance has emerged. Secondly, it is completely safe to use, and thirdly, its action is almost instantaneous. What other insecticide can claim these three vital advantages?

Make sure your *insecticides contain Kenya Pyrethrum*

The Pyrethrum Board of Kenya, the largest producers and distributors of pyrethrum in the world. Complete information is available from: The African Pyrethrum Technical Information Centre Ltd., 215-217 Grand Buildings, Trafalgar Square, London W.C.2 (Tel.: TRAfalgar 4288) and P.O. Box 420, Nakuru, Kenya Colony.

KENYA PYRETHRUM

★ **Practically no insect immunity**
★ **Completely safe to use**
★ **Almost instantaneous knockdown**
★ **No danger to foodstuffs**

1961

Editorial Comment

Aid Without Strings

AID MAY come to the under-developed and the primitive countries of the world in many forms and through many agencies — World Bank, WHO, UNESCO, UNICEF, FAO and the Colombo Plan—Russia and China are working independently of these supranational organisations. When individual countries act in this way it is difficult, if not impossible, not to suspect that aid given directly has not got some strings attached.

Speaking on the occasion of the WORLD CROPS Birthday Anniversary Dinner at the Royal Commonwealth Society's headquarters in London, Mr. V. E. Santiapillai, Trade Commissioner for Ceylon, illustrated in an amusing manner the essential difference between material aid and technical aid given in the form of advice.

We do not vouch for the truth of his story, but here it is for what it is worth. The Australian Government, which, incidentally, has very generously given assistance to Ceylon in a variety of ways under the aegis of the Colombo Plan, once sent a prize bull for breeding purposes. It was duly introduced to the most charming of the Ceylon 'ladies', but, strangely enough, it showed little interest. This indifference persisted for several weeks. A complaint was sent to Australia asking what should be done about it and the reply received was to counsel patience, as the animal must be given time to accustom itself to the climate and new environment.

Months and months went by and still nothing happened. At last, in desperation, the veterinarians of the Department of Agriculture called in a venerable character who understood the languages of the animal kingdom. He spoke to the bull severely and asked why the ladies of Ceylon failed to find favour in his eyes. The bull tossed his head impatiently and explained that such frivolities did not come within his terms of reference, for he had only been sent to serve in an advisory capacity.

Missionaries Abroad

The principal guest at this dinner, Prof. G. E. Blackman, of Oxford University, was one of those who had been actively concerned in the genesis of WORLD CROPS, which he had welcomed for its primary purpose of disseminating knowledge of recent advances in scientific agriculture, for even at that time he had been impressed by the isolation of scientific workers overseas and their ignorance of parallel developments which were taking place even in adjacent countries. They seemed also to be quite out of touch with the latest discoveries and new ideas then being developed in Europe and America.

This lack of up-to-date knowledge, he said, applied not only to research workers in Departments of Agriculture, but also in its practical applications to plantation managers and superintendents of large agricultural projects.

The need is even greater today following the change over from colonial status to independence and self-government. The abruptness of the change had, he said, frequently disrupted agricultural research and development, and political uncertainties and insecurity of employment had led to an exodus of highly-qualified European research workers without their effective replacement by local people because a sufficient number of properly qualified and experienced men were just not available.

This lack of scientific personnel has made these countries turn to international organisations for advice and technical assistance. Much of this help has had, perforce, to be given on a short-term basis, because highly-qualified experts and specialists could not be recruited for longer periods. Unfortunately, because of the difficulties of recruitment, some of these experts have not been very expert and, in any case, many problems cannot be solved on a short-term basis.

He concluded that it was essential for schemes to be worked out to ensure personal security and continuity of employment and he forecast the establishment of an Overseas Agricultural Service, consisting of men who would be prepared to devote their lives to service in any country, anywhere in the world, in need of their expert knowledge and guidance.

The World and World Crops

The sudden and almost simultaneous assumption of self-government by so many ex-colonial territories without adequate preparation over a long period of years might well result in a serious contraction of world trade, for, no matter how serious the need for more food and more raw materials, it is not easy for men with insufficient executive experience to bring the best of plans to a successful conclusion.

The editor of WORLD CROPS, Mr. Frank Cooke, spoke on the difficult and involved subject of the promotion of overseas trade—all ways—north and south, and east and west, and both ways—both export and import—because it is necessary to assist and encourage exports from the countries to which we in turn hope to sell our products. It is also necessary to build up confidence and provide the necessary credits and grants-in-aid.

He pointed out that it was through the introduction of modern methods and machines that the people of the more advanced countries 'have never had it so good' and that it was through the lack of them that two-

thirds of the people in the world have not enough to eat. In spite of the good work of FAO, the gap between the more advanced and the backward countries of the world was still growing.

While some nations have learned to use machines and apply modern methods to increase their agricultural productivity and make the fullest use of their available land, other countries, with steadily mounting populations, are still wedded to the use of hand implements, bullock power and primitive methods; in fact, a mystical significance is sometimes attached to age-old methods of land use and land tenure, quite oblivious of the growing needs of a changing world.

The existing agricultural lands in some countries need to be made four or five times more productive. This means that powered subsoilers are required to break up hardpans and so expose fresh sources of fertility and increase the water-holding capacity of the soil; water needs to be introduced at certain seasons and used economically; better seed must be used to secure higher yields and better produce; manures and fertilisers must be correctly applied; crop pests and diseases must be kept under effective control; and modern methods and machines for the more effective processing of the products of agriculture are needed.

He foresaw a gradual reduction in the volume of world trade unless a positive effort was made not only to maintain production, but also to increase the productivity of the more backward agricultural areas. He considered that the businessman really held the key to the situation, but new methods were needed to meet the changing situation. Few, if any, of the agricultural officers of the former colonial governments will soon be left, and the estate managers and planters, too, will grow fewer as the years pass. It is true that they will gradually be replaced by local people, but many of these will lack the dynamic approach needed to give the 'new look' to agriculture.

While some countries are sending trade missions to the new countries, Britain appeared to be resting on its laurels in the firm conviction that the peoples of these new countries will give Britain favoured-nation treatment in appreciation of the good work done for them during the past hundred years and because the handing over of the machinery of government in a sound financial condition was so smoothly and so peacefully executed. In this matter, he concluded, we need to be realistic.

Health and Grass

THE REPORT of the Committee on Grassland Utilisation (1958) said that 'an important influence working against the intensive use of grassland is the fear felt by many farmers, that improved grassland will bring with it dangers of increased animal health disorders'. More attention to research on the causes of diseases linked, rightly or wrongly, with intensively managed grass was therefore recommended.

A paper read by a Dutch scientist, H. van der Molen, to the Fertiliser Society in late 1960 shows that 10 years' experience with heavy applications of nitrogen on grassland in the Netherlands should have shattered most apprehensions about animal health risks arising from the use of high-output grass as the major portion of the animals' diet. Probably no farmers in the world use more nitrogen per acre of grass than the Dutch, the overall average rate being over 80 lb. an acre.

This paper, however, deals with far higher rates—rates of over 180 lb. per acre, which have been used on a number of experimental farms year after year, and on some of them for 10 successive years. If, even by Dutch standards these rates are high, by British standards they are extraordinarily high.

Actually, on all these farms average milk output per cow was slightly higher than that on similar farms in the areas. This alone is not proof, for the animals on the experimental farms may have been better quality stock than on the commercial farms. But if any exceptional incidence of disease or impaired health had occurred, milk production should also have been affected.

The fertility index of the cows on these high-nitrogen farms was slightly better than the index for other cows using the same A.I. centres; this, too, would be most unlikely had health been affected by intensively grown and intensively used grass.

Most important of all, hypomagnesaemia or grass tetany occurred only in odd cases, except on one of the 15 experimental farms, and even on the one farm where the outbreaks had been serious this was remedied and there was no further incidence of tetany in 1957, 1958 and 1959. On not one of the 15 farms was there a single case of hypomagnesaemic tetany in 1959, though for some farms this was the ninth successive year of the very heavy nitrogen applications. Yet it is this animal disease, above all others, that is regarded by many British farmers as being caused by intensively grown grass!

Heavy Nitrogen

On some of the Dutch experimental farms, annual nitrogen rates per acre have now reached well over 200 lb., and among the 1958 rates quoted are 287 lb., 331 lb. and 243 lb. Most of the grassland in Holland is permanent. We have to reflect that a generous estimate for the average use of nitrogen on British permanent grassland is, say, 20 lb. an acre, while from 60-70% of British grassland does not receive any nitrogen as fertiliser at all! It is surprising that what is so effective, profitable and yet unharmful just across the North Sea is neglected in Britain, where grass is still the leading agricultural crop.

Seed Dressings and Wild Life

So often opinions which have received prominence in the press about the use of fertilisers and agricultural chemicals are merely speculations; seldom, if ever, are they based on sound experimental work conducted on scientific lines. More often they are just an appeal to the emotions, *e.g.* 'Poison on Your Plate' (World Crops, 1960, **12**, 329).

Recently Capt. C. F. Crawshay, believing that no experimental work had been done by manufacturers or others to find out the toxicity to birds of seed dressings, acted as a public-spirited farmer and initiated certain experiments on behalf of an organisation called the Animal Health Trust. Unfortunately, the report of the work received prominence in the press before the people most concerned had had an opportunity to examine it.

This is all the more to be regretted, since there are several unsatisfactory features about the experiments and the conclusions drawn are not properly supported. Nor is it true that 'no firm scientific inquiry appears to have been made into the alleged toxicity of these substances'. On the contrary, we know that considerable research on both animals and birds has been carried out by the manufacturers over a period of many years. Some of their results have been published and discussed since the early 1930's.

The soundest conclusion of the report is that birds can die if given dressed grain as a *sole* source of food for a period of 30 days. But this was already known. It is obvious that if the dressed seed had been adequately covered with soil during drilling operations it would not be available to the vast majority of wild birds and would then certainly not be the sole source of food.

A.B.M.A.C.—the Association of British Manufacturers of Agricultural Chemicals—welcomes the co-operation of responsible investigators, as its previous chairman, Mr. G. Huckle, said at the annual dinner last year.

Collaborative Research

Following this there was a meeting of interested organisations at the end of 1960, when it was agreed that: (1) Seed dressings play a very valuable part in agricultural production. (2) Not all seed dressings present a hazard to wild life. (3) That seed dressings containing dieldrin, aldrin and heptachlor can kill birds that eat dressed seed and some foxes have died through eating the birds so killed.

Following these conclusions, collaborative research between the manufacturers and scientific officers of the Ministry of Agriculture, Fisheries and Food is to be initiated and publicity is being arranged to ensure that adequate precautions are taken in the use of seed dressings.

Poisons Freely Available

It is certainly to be deplored that highly toxic agricultural chemicals are all too freely available in some overseas countries. Writing from Capetown, W. L. Speight, our South African correspondent, has reported that 'farmers can obtain, through their co-operative societies and country stores, an organo-phosphorus compound (unnamed) so deadly that contact with the skin can kill'. The vendors can obtain a licence to sell merely by applying to a magistrate, and these licences, he writes, are being issued in wholesale fashion.

Obviously there is need for stricter control so that the buyer can always be properly warned and advised regarding the use of protective gloves and clothing and the proper conditions of use. These, we know, are stated on the label, but what happens when the buyer cannot read Dutch, English, French or German?

Moving On

Nevertheless, the science of pest control is moving on and as a result of continuous and intensive research by responsible manufacturers new non-toxic products are appearing. These have been properly developed, investigated and proved over a period of years at a cost of between £250,000 and £500,000 for every new product introduced. Unfortunately, owing to the geographical time-lag or because of lack of advertising, overseas users are not aware of their existence for two or three years and will go on using the former methods.

One of the most toxic insecticides is parathion, which

'If you ask me, these spray chemicals are a grave danger to public health'

is still used on a very large scale in spite of the fact that there are now non-toxic chemicals which can do the job equally as well. A new product, dimethoate (see WORLD CROPS, 1960, 12, 358), is just as efficient as parathion and much less toxic.

Something for Nothing?

THERE IS a broad classification for all mankind, irrespective of mental powers or physical strength, race or religion, facial features or epidermal pigmentation. People, we have found, are either 'bogus' or 'genuine'.

The same broad classification can be applied, too, in the business of publishing. There are technical publications which boast of large circulations, which they euphemistically describe as 'restricted' or 'controlled' circulations, when the cold fact is that they are simply 'give-aways' . . . no matter how well they are claimed to be 'placed in the right quarters'.

The simple fact is no one values anything which they get for nothing. Thus in the distribution of planting material and seeds to smallholders some price, however small, must be paid by the recipient; otherwise high-grade planting material, produced often at considerable cost, may be put on one side and forgotten, if it is given away free on a 'restricted circulation' basis.

Behind the façade of a big circulation figure so-called technical journals, distributed free to a 'restricted' clientele, are seldom read, seldom even opened after the first issue or two because of the poor quality of the editorial matter.

We know because we have received journals of this type during the course of our 30 years' service overseas. If they are even looked at, it is at best a case of single-person readership.

True Circulation

WORLD CROPS has been rudely dismissed as 'high-brow' by one of its self-styled competitors, but the recent readership survey revealed that 99% of the people who buy this journal are quite satisfied with the editorial matter, though some would like more about agricultural machinery or more about agricultural chemicals, according to their particular interests. Nevertheless, they read their WORLD CROPS; in fact, a single copy in a library may be read by a hundred people, or it may be loaned between friends. The survey reveals that *on average a single copy is read by five or six people.*

We are thus in a position to assess the true pulling power of a controlled circulation of, say, 10,000 copies, only a quarter of which are actually opened and read, as against a paid circulation of, say, 5,000 copies which are *read* by a total of some 25,000 people. The true readership is obviously ten times as great.

Making Known

A technical journal, of course, lives by its advertising, and without it a copy of WORLD CROPS would cost far more than just the price of a single packet of cigarettes. The advertising matter, too, is both useful and informative and must be treated as complementary to and an essential part of the journal.

The articles in WORLD CROPS not only deal with various aspects of the production of the crops of the world, but also with the products of the manufacturers of agricultural machinery and chemicals, which are today playing such a tremendous and vital role in the development of world agriculture. It is only by making known and having their products explained in simple straightforward language, without superlatives, that the full impact of modern machinery and methods on world food production can be assured.

This Month's Cover Picture

The new factory of the Union Carbide Corporation at Institute, West Virginia, U.S.A.

The latest scientific and engineering techniques are used to produce 'Sevin' insecticide, which is being increasingly produced to meet the ever-growing demands of the leading agricultural countries in the world.

'Sevin'—a new carbamate insecticide has the following essential characteristics:

(1) *Safety*—for man, animals and crop. No protective clothing or equipment is needed during handling and application and no poisonous residues are to be found in the meat or milk from animals fed on 'Sevin'-treated forage.

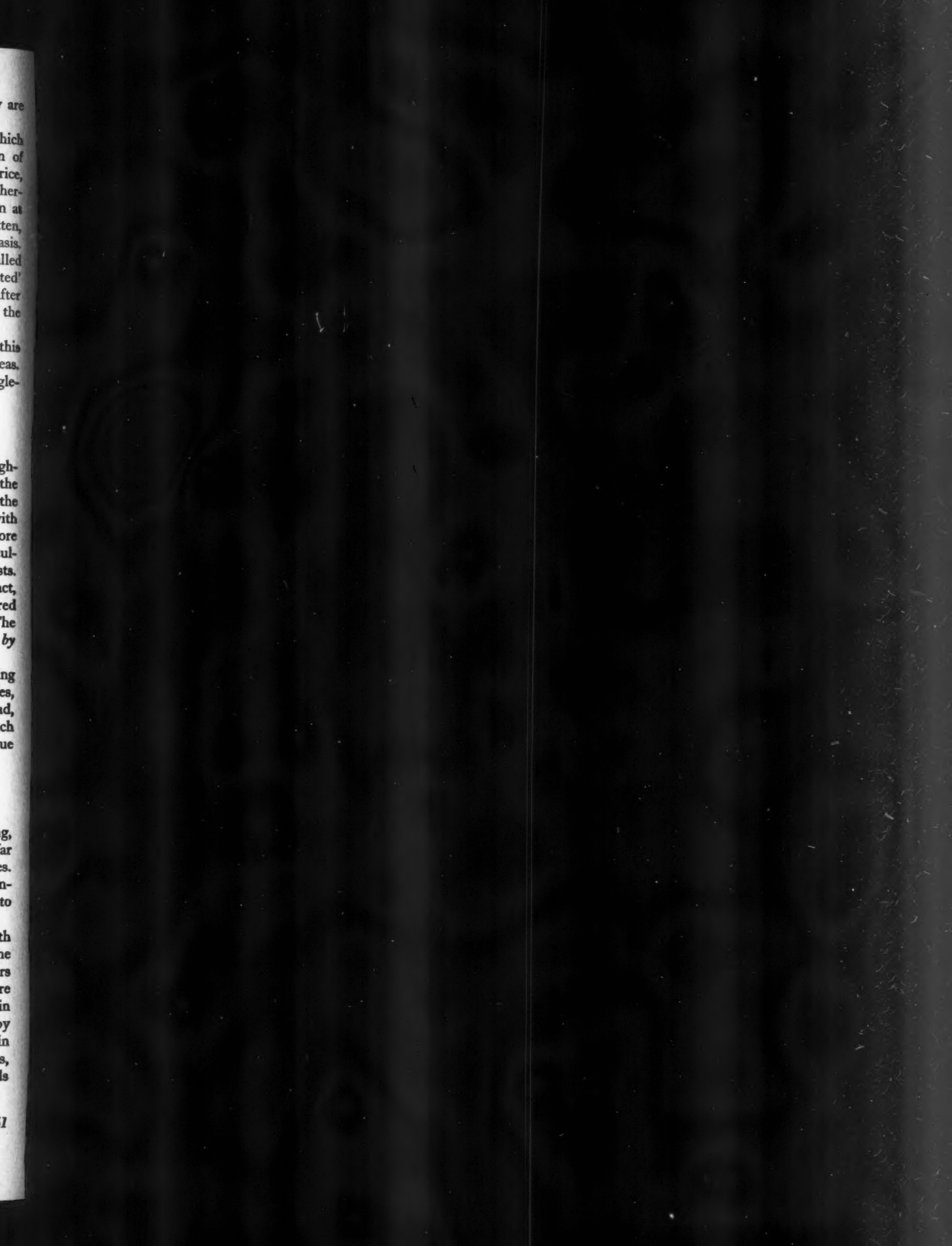
(2) *Effectiveness*—It controls most insects on a wide range of crops—even those insects which have developed resistance to some of the earlier insecticides.

(3) *Persistence*—It is longer-lasting and has a greater residual effectiveness than most other insecticides.

(4) *Economy*—This means fewer applications are called for, less labour is required, less insecticide is used, and the spraying equipment requires less maintenance, while crop yields are increased.

UNION CARBIDE INTERNATIONAL CO.
270 Park Avenue, New York 17, U.S.A.

Advertiser's announcement



Blasting in the northern desert to mine Chilean Natural Nitrate

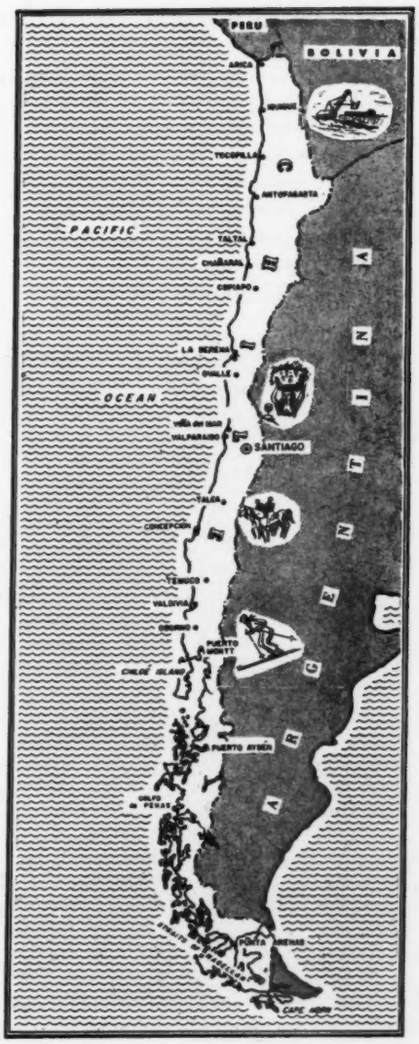
Chilean Agriculture

RAUL AGUIRRE, ING. AGRONOM.*

Chile is known throughout the world as the only producer of natural nitrate of soda, the oldest commercial nitrogenous fertiliser. Her exceptionally favourable soil and climatic conditions enable Chile to produce a variety of high-quality agricultural commodities. Her wines, fruit and grains find ready markets overseas, especially in Europe and the U.S.A.

CHILE stretches along the west coast of South America from the tropical latitude 18° S nearly to Cape Horn. Although her territory exceeds 2,500 miles in length, it extends to an average width of only 110 miles and in many places is not more than 50 miles wide. Owing to Chile's great length and to her isolation—a vast desert bounds her to the north, the high Andes to the east and the Pacific Ocean to the south and west—her political and agricultural evolution has proceeded as if her territory were a chain of islands, most communications being by water. This geographical fact has moulded her national character.

Compared with most European countries, Chile is large. She extends to 286,000 sq. miles (excluding Antarctica), about three times the area of Great Britain and one and a half times that of France or Spain. However, desert, forest, barren mountain or rough grazing land cover most of the country and the area of arable land is only about 20,000 sq. miles, which is about 25% less than that of Great Britain. Because of desert conditions in the north and rain storms, gales and blizzards in the south, most of the agriculture is concentrated in the middle third of the country, between La Serena and Temuco, where excellent climatic conditions prevail.



Climate

The climate of the main agricultural area is temperate. No part of Chile extends very far from the sea, which exercises a moderating influence on the climate throughout the country. Four clearly marked seasons occur as in Europe and consequently all temperate and Mediterranean crops grow well.

An extremely clear, dry atmosphere, mainly due to the low temperature of the sea, characterises the climate. It is possible that the high quality of some of the agricultural produce—fruits, wines and lentils—is due to the highly translucent atmosphere.

Rainfall is very low in the north—

*Ingeniero Agronomo, University of Chile.

4 in. per annum—but it increases progressively from the north to the south, where it reaches 60 in. In the agricultural area in the central region it ranges from 10-30 in. The rainfall is badly distributed from the agricultural point of view, being practically confined to the winter, and varies greatly in total amount from year to year. Consequently rain-fed agriculture carries considerable risks and irrigation has been developed on a large scale. The total area under irrigation covers 3.4 million acres. Rain-fed agriculture takes place along the coast, but the yields are relatively low.

Soils

In general, the soils of the agricultural region of Chile vary in accordance with the rainfall. More fertile soils with a higher base content predominate in the north. In the south, under conditions of higher rainfall, the soils are more acid, less well supplied with bases, rather light in texture and with a higher content of organic matter.

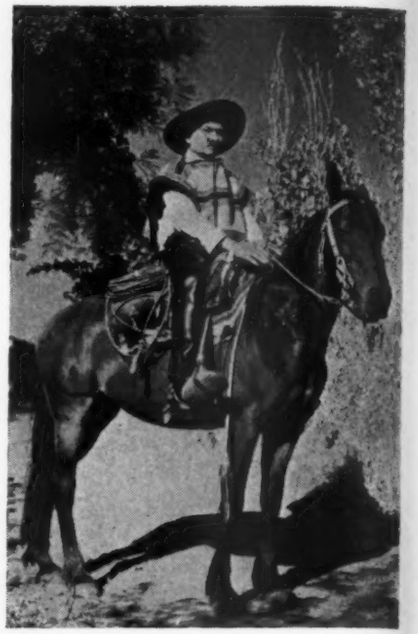
Agriculture

Chilean agriculture can be classified as temperate. Cereals, leguminous crops, vines and orchard fruits, such as apples, oranges and peaches, constitute the main crops. Tropical crops are grown only in small isolated subtropical oases in the north.

Agricultural methods follow the pattern of European and North American practice. For example, wine producers use French traditional techniques and maintain close contact with France, in order to conserve and improve the already high production standards. Fruit growers, on the other hand, lean more towards U.S. practice, and specially to California, owing to similar agronomic conditions.

Some 20 agricultural experimental stations located in the various regions

Harvesting the barley crop with a sickle



A typical Chilean farmer

constantly study to improve local farming methods and adapt foreign varieties and techniques to Chilean conditions. The Government is most interested in the improvement of Chilean agriculture, which forms the main activity of the country and on which at least 30% of the population depends.

Due to the natural limitation of the agricultural area of the country, production can be increased only by improved methods and higher yields.

Cereals

Cereals constitute the primary crops of Chile. Wheat far exceeds the others in importance and is cultivated on about 2 million acres each year. Three-quarters of this area is rain-fed with an average yield of 1,200 lb. per acre. Irrigated land yields at least 100% more. Chile produces about 1 million tons of wheat, but this is not quite enough for her 7 million inhabitants and she has to import about 200,000 tons annually.

Other cereals cover a further half-million acres. In descending order of importance these are: oats, maize, barley, rice and rye. The average yields are 1,000, 2,000, 1,500, 2,400 and 700 lb. per acre respectively. There is an export trade of oats and barley amounting to about 20,000-30,000 tons of each per year.

Cultivating a vineyard in Chile where 250,000 acres are used for grape production

Leguminous crops

Beans, peas, lentils and chickpeas are grown. Beans are extremely important, as they supply the bulk of the protein in the diet of the population. These four crops cover some 325,000 acres; 60% of this area consists of beans and 20% of lentils. The total production exceeds 100,000 tons. Some 40,000 tons, mostly of beans and lentils, are exported. Chilean lentils excel in quality and are much appreciated in certain markets, notably France.

Fruits

The agricultural area in the centre of Chile enjoys specially favourable climatic conditions for the production of all fruits. In this respect Chile has been frequently compared with California, as the two areas are similar in many ways. The main fruits cultivated are apple (2½ million bearing trees), peach (2 million), orange (1 million), lemon and olive (800,000 each), plum (600,000), pear and cherry (400,000 each) and almond, avocado pear and apricot (200,000 each).

As Chile lies in the Southern Hemisphere, its seasons are the opposite to those in Europe and the U.S.A. Fresh fruits can thus be exported to these regions before and after local production. This favourable seasonal factor, together with the excellent quality of her produce, has enabled Chile to build up an export trade in fruits of about 20,000-30,000 tons a year. The fruits exported consist principally of apples, melons, grapes, plums, prunes and peaches.

Broadcasting Chilean Natural Nitrate over brassica crops—the average application is 5 cwt. per acre. The Chilean Government gives a 50% cash subsidy to encourage fertiliser usage

Tobacco

Chile cultivates about 6,250 acres of tobacco, which yield about 16 cwt. per acre, giving a crop of some 5,000 tons a year. This tonnage largely satisfies internal consumption. There is only a small import, mainly for blending purposes. Paraguayo, a strong air-cured cigarette tobacco, exceeds other varieties in importance. Virginia and Burley are also grown.

Sugar-beet

Sugar-beet growing was established a few years ago, mainly in the south, with a view to reducing foreign exchange expenses on sugar imports. About 15,000 acres are cultivated, which yield some 30,000 tons of sugar. This is only about one-seventh of

Vines

Probably the best known Chilean agricultural export is wine. Due to rather special soil and climatic conditions, Chile is able to produce a great variety of wines, the quality of which compares well with the best European types. Vineyards cover about 250,000 acres. 100,000 acres are irrigated and the balance is rain-fed. Thanks to their isolation and remoteness, Chile's vineyards have escaped the attack of phylloxera, the pest which once ravaged European vineyards.

Wine exports to other Latin American countries and also the U.S.A. and Europe total 10-15 million litres a year. It is interesting that France is a regular importer of Chilean wine.

Part of the grape crop is consumed fresh or used for the production of raisins, 50,000 tons a year are consumed domestically and 5,000 tons of fresh grapes are exported annually.

Fruit-growing in the Acongua Valley. Note the wind-belt dividing the orchards

Sheep on a southern estancia or ranch

Chile's needs and so production is being increased.

Oil crops

Sunflower and rape seed crops cover about 100,000 acres between them. This small area does not supply all the edible oils required for local consumption. Sunflower yields average about 1,700 lb. per acre.

Fibre crops

Hemp and flax cover 8,000 and 6,000 acres respectively. Hemp is chiefly cultivated in the highly fertile valley of the Aconcagua River, where it is one of the main crops and creates considerable work and prosperity. A substantial proportion of both fibres is exported. Chilean hemp sells readily in Europe because of its excellent quality.

One of the sub-tropical oases in the northern desert; in the background is the Lincancabur Volcano

Horticultural produce

Vegetables are grown chiefly for local consumption and production is concentrated near the big cities. However, a considerable acreage of onions and garlic is grown for export; owing to its high quality, this produce finds a good market, mainly in Europe. The annual export of the two crops totals 20,000 tons and is valued at about three-quarters of a million pounds.

Forest produce

Forests cover a large part of Chile—about one-fifth of the whole country. Of this, about 1 million acres consists of plantations. Exports of sawn timber are high and account for about £4 million per year, which is nearly 25% of the total value of the agricultural exports.

Fertiliser use

Fertiliser use is relatively low in the more fertile northern and central parts of the agricultural zone and higher on the lighter less fertile soils of the south. For obvious reasons, the most popular fertilisers are natural nitrate of soda and natural potassic nitrate of soda, both of which are mined from the deserts of Northern Chile and shipped from the ports of Tocopilla and Iquique. Some 100,000 tons of natural nitrates are used every year. Although Chilean nitrate of soda contains no potassium and Chilean potassic nitrate of soda only 10 or 14% K_2O, these fertilisers often show a considerable potassium effect due to the potassium-substituting property of the sodium

(*Continued on page* 55)

Varietal improvement in practice. Improved rice seedlings for transplanting, on sale to West African farmers

Fertilisers and Food Production

1—Results of Field Experiments in Agriculturally Backward Countries

H. L. RICHARDSON, D.I.C., M.SC., PH.D.*

Every thinking person today knows that the rapid increase in the world's population raises serious problems of food supply, especially in the less developed countries, and that these problems are likely to become worse. This article describes what fertilisers can do to increase world food production.

IT is obvious that good crops cannot be grown without adequate supplies of moisture; that selected and tested new varieties will give better yields than the old ones; that improvements in cultural methods and farming systems, including mixed farming and more production of local manures, will make still higher yields possible; and that crops have to be protected from weeds, pests and diseases.

It is further true that these improved techniques can do relatively little to raise average yields on most soils without chemical fertilisers; whilst fertilisers can do much more with the help of such improvements than they would be able to alone, so we cannot wholly isolate the effect of fertilisers from the influence of other factors.

Basis of the review

In the less developed countries, fertiliser field trials are carried out, quite rightly, on the farms of peasant cultivators who are using primitive or traditional farming methods. With inexperienced farmers and unimproved crop varieties it is best to start by using fertilisers at low rates of application, but even so these other factors may limit the responses. Consequently a study of the results of these experimental programmes leads to rather modest estimates of what fertilisers could do to increase crop yields. It is necessary to examine further what fertilisers could do, along with other major improvements, when the traditional agriculture of such a country is being developed and modernised, as it surely will be.

In this way the writer has studied the effects of fertilisers in a number of representative, agriculturally less developed countries where large schemes of fertiliser trials and experiments have been carried out. These are China, India, Ghana and Mexico. For an independent check on the conclusions so reached the history of crop yields in England, Japan and Formosa has also been examined, and yet another check has been provided by comparing the yields secured at agricultural research stations in under-

* Imperial Chemical Industries Ltd.

West African children who have been laying out fertiliser trials in school gardens

developed countries with those of the peasant cultivators in the surrounding country. The crops selected for study are, as far as possible, the chief cereal crops in each country, which are the chief sources of the home food supplies.

Possibilities in China

Rice. Before and during the last war large programmes of fertiliser field experiments were carried out in China. The over-all averages from nearly 300 rice experiments showed a total fertiliser response of 755 lb. of rough or paddy† rice per acre, the average yield without fertilisers being 2,100 lb. per acre.‡ The average direct response to fertilisers, used at rates close to 56 lb. each of nitrogen, phosphate (P_2O_5) and potash (K_2O) per acre, was thus 36%.

Although Chinese farming is efficient at a traditional level, and the soils are moderately fertile, there is still room for improvement in crop varieties and cultural methods, and in pest and disease control. Experience in China, Japan and Formosa indicates that the average effects of such improvements, including their interaction with fertilisers are around 15% for better crop varieties; 15% for cultural methods, including water control; and 10% for pest and disease control, giving a total increase of 40%.

Adding this to the 36% for direct response to fertilisers, a 76% increase in yield may be expected as the overall result of using fertilisers, at 56 lb. of each plant food per acre where needed, along with the other technical improvements. The average yield in mainland China, in the last years for which dependable statistics are available, was 2,330 lb. of paddy per acre, so that the improved yield on this basis would be 4,100 lb. per acre.

From the results of experiments in China at different rates of application it is estimated that if nitrogenous fertilisers were used there on rice at 80 lb. per acre, along with phosphate and potash, where needed, at 56 lb. per acre, the direct effect of the fertilisers would be to increase yields by 46% instead of the 36% mentioned earlier. Adding 40% for the effects of other technical developments, the effect of heavier fertiliser use would be to increase present rice yields by 86%. This represents another 2,000 lb. per acre and would give an eventual average yield of 4,300 lb. of paddy per acre in China.

This figure is close to the average yield of paddy in Japan today, which helps to confirm that the assumptions are not too wide of the mark. Even this is not the end of the story, because with new varieties and improved water and disease control still heavier manuring will be practicable.

Dry-land cereals. These include wheat, grown in the centre and north as a winter crop, and the summer grains—maize, millet and sorghum—which are important sources of food in Western and Northern China.

Wheat yields and fertiliser responses are limited by the dryness as well as the coldness of the Chinese winter. In consequence the average yield of unfertilised wheat in the experiments was low, being only 1,120 lb. per acre, and so was the direct response to fertilisers, which totalled 460 lb. per acre or 41%. If, as with rice, we add another 40% for the effects of the other improvements, the combined response to fertilisers and other developments likely to go on simultaneously would be 81%—an increase of four-fifths over current yields.

The national average yield of wheat in China being 780 lb. per acre, fertilisers at 56 lb. of each plant food per acre and other improvements would add a further 630 lb. per acre, giving a total improved yield of 1,400 lb. per acre. This is still low by the standards of intensive agriculture, but it is doubtful whether much more could be expected without irrigation. With irrigation, or a great extension of the area of wheat that is at present irrigated, further dramatic increases in wheat yields would be possible.

Summer grains. Being grown during the warm and wet summer monsoon, maize, millet and sorghum give larger responses to fertilisers than does wheat in China. In the field experiments the average response to fertilisers was 755 lb. per acre, the average unfertilised yield being 1,800 lb. per acre—an average direct response to fertilisers of 42%.

This is similar to the corresponding percentages for rice and wheat in China; by a parallel line of argument the combined response to fertilisers and other developments can be expected to be about 82%, where the fertilisers are used, where needed, at 56 lb. each of nitrogen, phosphate and potash per acre. From yield-response curves, the combined response, if the rate of application of nitrogen were raised to 80 lb. per acre, would approach 100%.

Possibilities in India

Rice. The results from a wide range of fertiliser trials and experiments, including many thousands of simple trials on cultivators' fields, have been reported in recent years. Combining the information from various publications, the average response of rice to fertilisers in India is 590 lb. of paddy per acre; this is the combined effect of nitrogenous and phosphatic fertilisers, applied where needed, at 30 lb. each of nitrogen and phosphate per acre. Figures for the average unfertilised yield in the trials are not available, but the overall average yield of paddy rice in India—most of which is un-

† Paddy is the whole grain, including the husk.

‡ This is a high yield figure for unfertilised rice, because the fertility of Chinese soils has been built up through the centuries by the traditional use of local organic manures.

fertilised—is 1,140 lb. per acre. On this basis the direct response to fertilisers is 52%.

Because farming in India is more primitive than in China, and Indian soils are less fertile—local manures being little used—a larger allowance can be made for the effects of other methods of agricultural improvements and their interactions with fertilisers. Cautious but reasonable estimates would be 20% increase, due to improved crop varieties, another 20% for cultural methods, and 10% for pest and disease control, the total being 50% instead of 40%, as in China.

Adding this to the direct response to fertilisers, the combined effect of using fertilisers with other developments proceeding simultaneously would be about 102%. In other words, the present yields could be doubled. The average improved yield of rice in India would then become 2,300 lb. of paddy per acre, which appears to be a realistic figure, for it falls between the present average yields in Malaya (2,000 lb. per acre) and in Formosa (2,700 lb. per acre).

By modern standards the rates of application used in the Indian fertiliser trials were low. This was because (*a*) Indian farmers are unaccustomed to handling chemicals and (*b*) the varieties of rice now grown in India cannot make use of much nitrogen. As the farmers gain experience and better varieties are produced, heavier rates of fertiliser application will become practicable.

From fertiliser response curves it is estimated that 80 lb. of nitrogen per acre, used on improved varieties along with phosphate and potash at 56 lb. per acre where needed, would produce an average direct response of 1,040 lb. of paddy per acre, or 91% of the present average yield. Adding to this another 50% for other agricultural improvements, an overall increase in yields of 140%, with an average production of 2,700 lb. of paddy per acre, should be possible.

This is still a modest figure, comparable with the present average yield of rice in Formosa, but far below that in Japan, and with the further improvement and intensification of farming that is likely to occur in India under the stress of hunger, the process of increasing yields is not likely to stop there. Average yields of 3,000 lb. of paddy per acre or over may eventually be achieved in India, if not in this generation, then in the next.

There is certainly no climatic barrier to obtaining higher rice yields in India, for in officially observed competitions Indian rice farmers have actually obtained yields on individual fields of from 8,400 to 11,200 lb. of paddy per acre.

Dry-land cereals

Wheat. As in China, wheat is grown in India during the dry, cold winter, and this leads to low yields and limited responses to nitrogen. With irrigation rather better results are obtained, and from the results of the field trials it is estimated that the average direct response to fertilisers (at 30 lb. each of N and P_2O_5 per acre) by irrigated wheat in India was 430 lb. per acre, or about 45% of the unfertilised yield. If, as with rice, we estimate a further 50% for other improvements, the combined response to fertilisers, at the low rates used in the trials, and to other developments proceeding simultaneously, would be about 95%.

Only one-fourth of the wheat in India is now irrigated, but irrigation is one of the major items in the successive Indian five-year plans, and the proportion of wheat so treated will surely increase. Allowing for this and other improvements, including greater fertiliser use, it may be concluded that the average yield of wheat in India could be doubled, and that further increases would follow. As the present average wheat yield in India is only 660 lb. per acre, twice this figure at around 1,300 lb. per acre would still be a very modest yield by the standards of intensive agriculture. Having in mind what has already been done in Mexico, it is reasonable to expect an eventual average yield of at least 2,000 lb. of wheat per acre in India.

Summer grains. These include, as in China, maize, millets and sorghum. Not much experimental work on these crops has been published in India, but judging from the stunted and starved appearance of these crops at present, there is no reason to doubt that what was found in China would hold good in India and that the present average yields of these crops could at least be doubled by the combined effects of fertilisers and other improvements.

Manurial response with guinea corn in the Northern Nigeria experiment. Foreground: *Plot lacking phosphate.* Background: *Complete fertiliser and farmyard manure*

Possibilities in Ghana

Guinea corn§ and millet. These are the chief food crops in the savannah belt of Central and Northern Ghana, as they are throughout this belt in West Africa. Large numbers of fertiliser experiments and simple trials have been carried out on both crops, and the average response of the two crops to low rates of fertiliser use (25 lb. N and 22 lb. P_2O_5 per acre) was 486 lb. per acre. The average

§ Guinea corn is a sorghum.

unfertilised yield was 714 lb. per acre, giving an increase of 68%.

Assuming, as for India, that the effects of other improvements would contribute another 50%, then the combined response to small applications of fertilisers and the other improvements would be about 120%. The average yield level would thus be raised to 1,560 lb. per acre.

Further, as Ghana farmers gain experience and learn how to use heavier dressings of fertilisers, yields will become even greater: doubling the experimental rates, which would provide dressings that are still moderate by modern standards, would give a direct fertiliser response of about 100% and along with other improvements a combined increase of 150% over current yields. The average yield level would then approach 1,800 lb. per acre. Similar yield figures have already been obtained in actual manurial experiments elsewhere in West Africa.

The poverty of the ordinary cultivator's crops of guinea corn and millet in this country has to be seen to be believed. However, it is very noticeable that the crops become taller, greener and heavier near the farmhouse compounds, where the plants receive household and human waste products. These observations also indicate what manuring could do to raise the production of these food crops.

Maize, yams and cassava. These are important food crops in the woodland and forest belts in the south. Here fertiliser trials at similar rates of application have given useful results, though the maize trials suffered from attacks of rust, and the low responses to fertilisers, *viz.* 20-30%, cannot be considered typical; cassava responded very well, with an average direct response of 77%; and yams, which, as far as possible, are planted on the more fertile soils, gave a 23% response.

A farm trial with yams in West Africa. The farmer who carried out the trials on his smallholding is on the left and the district agricultural officer is on the right

With heavier rates of application than the small ones employed in the trials there would have been larger responses; and, as with the crops already discussed, an allowance should also be made for the influence of other improvements proceeding at the same time, although we have not enough information to evaluate these additional effects.

Possibilities in Mexico

Wheat. Since the last war a planned and intensive programme of agricultural development has been carried out through co-operation between the Rockefeller Foundation and the Mexican Ministry of Agriculture. Remarkable results have been obtained, particularly with wheat, which is mainly grown as an irrigated winter crop.

Most of the soils have been exhausted by continuous cropping and are low in available nitrogen, so that even with irrigation the average yield is low. Under these conditions there have been very large and widespread fertiliser responses and heavy rates of application have proved profitable.

In one experiment in which various rates of nitrogen were combined with different levels of soil moisture the best irrigation only raised the yield from 587 lb. of wheat per acre to 612 lb. per acre where no fertiliser was used. Nitrogenous fertiliser at increasing rates produced continuously higher yields, reaching 2,154 lb. of wheat per acre with the poorest irrigation and 3,990 lb. per acre with the best, when the fertiliser was used at a rate of 135 lb. of N per acre. The increase with heavy nitrogen and better irrigation was thus 3,403 lb. above the unimproved yield, a response of 580%. The original yield was multiplied nearly seven times!

The figures well illustrate the type of interaction mentioned earlier, in which fertilisers become still more effective when other growth factors are also improved. Such heavy rates of nitrogen as these could only be used successfully because much research work had also been done to produce new wheat varieties resistant to lodging and disease.

Hundreds of field trials have been carried out in the course of the research and development work in Mexico. It required about 10 years of such work and the gradual building up of a comprehensive farm advisory service before the peasants began to try the new methods; then they adopted them enthusiastically, and it has been reported that some farmers are harvesting 2,700 to 3,700 lb. of wheat per acre on land which yielded only 370 to 620 lb. per acre only four years earlier. In the course of achieving this peasant farmers who had hardly seen chemical fertilisers before were soon applying dressings of up to 120 lb. of nitrogen per acre—even heavier applications than those used by wheat farmers in the U.S.A.

The effects of this can be seen in the average yields of wheat in Mexico, which were 732 lb. per acre in 1946, 767 lb. per acre in 1952, and 1,401 lb. per acre in 1958. By now the average yield of wheat in Mexico will have been doubled as a result of using fer-

tilisers along with other improvements, and the experimental results suggest that the average yields could eventually be doubled again. Mexico can indeed look forward with certainty to average wheat yields three times those obtained before fertilisers and other improvements were introduced.

Maize. This is the chief food grain in Mexico and, like wheat, has shown striking responses in fertiliser experiments. The actual results have been less striking than with wheat: this is partly because low rainfall or high altitudes limit maize yields and fertiliser effects in some regions, and partly because the maize growers in the remoter regions are more backward and harder to persuade than the wheat growers.

However, yields of maize are beginning to increase: in 1946-47 the average yield was 660 lb. per acre, in 1957-58 it was 730 lb. per acre, and the estimate for 1959 is 760 lb. per acre. There is a large gap between this and the present yield of 2,900 lb. per acre in the U.S.A. If Mexican maize growers could only half bridge the gap, the average yield could be around 1,800 lb. per acre. In view of what has been achieved with wheat, this would seem to be a modest target.

(*To be continued*)

Chilean Agriculture

(*Continued from page* 50)

which they both contain. In addition, owing to their base-saving value and the action of sodium in rendering soil phosphates more soluble, Chilean nitrates produce a definite phosphate effect apart from their nitrogen-potassium action.

The Chilean Government, which is interested in raising yields per acre, has recently approved a 50% cash subsidy on all fertilisers. It is obvious that this high subsidy will significantly increase both fertiliser use and agricultural production.

Livestock production

Owing to the limited area of suitable grazing land, the Chilean cattle population amounts to only about 3 million head, and meat production is insufficient for internal needs. The cattle are raised mainly on lucerne (alfalfa) and clover, but there are also 900,000 acres of artificial pasture. There are some 250,000 acres of lucerne and some 600,000 acres of clover. Lucerne is cultivated in the north and occupies about one-tenth of the irrigated area of the country. Towards the south, as soils become progressively more acid, lucerne is replaced by clover.

Sheep rearing finds excellent conditions in Chile, especially in the cold territory in the extreme south. The sheep population amounts to about 6 million, half of which are in the provinces of Aysen and Magallanes in the extreme south between 45° and 50° S. The sheep industry is prosperous and modern. Some 6,000 tons of wool are available for export each year.

Summing up

Despite the limited area of arable land, Chile is able, thanks to her exceptional climatic conditions, to produce a wide variety of high-quality agricultural commodities. These command a ready and increasing market overseas.

The provision of a cash subsidy to encourage the use of fertilisers is a wise step which, together with the ready availability of natural nitrate of soda, is certain to have far-reaching effects on the economy of Chile and provide the capital for modernising her agriculture.

Dolomite as a Fertiliser

The full results are now available from an experiment carried out by the Rubber Research Institute of Malaya for testing the effect of magnesium limestone on a mature rubber area showing symptoms of magnesium deficiency.

Growth

Magnesium limestone increased the rate of growth in the first and in each subsequent year. When the measurements were stopped in 1959 there had been an increase in growth (over the eight years of the experiment) of 39% from the 1½-lb. applications and an increase of 51% for the 3-lb. applications, compared with the control plots. Foliage colour improved noticeably in the magnesium-treated plots soon after the fertilisers were applied and in the later years there was a marked effect on the time of wintering, the magnesium-deficient control plots wintering much earlier than the plots treated with magnesium.

Yield

Yield did not appear to respond to the magnesium limestone as quickly as growth and it was not until five years after the first application that yield increases were statistically proven. In subsequent years the response increased until in 1958 the magnesium-treated plots (the highest level) were yielding 14% more rubber than the controls. This slow response in yield emphasises the long-term nature of the manuring of rubber trees and shows that the full effects of fertilisers may not be obtained until several years after they have been applied.

Other fertilisers

The other fertiliser treatments did not give results as striking as those for magnesium. Potash had no definite effect on growth or yield, but a nitrogen/phosphate mixture gave definite responses in growth at both rates of application. On yield, however, the effects were smaller and were only definite in one year (1955-56).

Recommendations

The benefits of using ground dolomite on a magnesium-deficient soil have been convincingly demonstrated, and in such areas the recommendation of the Institute is to apply 2-3 lb. per tree of magnesium limestone and to follow this up by the use of fertiliser mixtures containing magnesium. If the deficiency symptoms persist, particularly in the later months of the year, a further dressing of magnesium limestone should be applied.

[*Similar results have been obtained for inland coconuts in Ceylon and dolomite is today being quarried there for use as a fertiliser for coconuts and rubber.—Ed.*]

Abstracted from *Planters' Bulletin* No. 50, 1960.

World Crops and Overseas Trade

THE eleventh anniversary of WORLD CROPS was appropriately celebrated at the Royal Commonwealth Society's Headquarters in London on 1 December, 1960.

The introduction of this International Journal of Agriculture in 1949 coincided with the beginning of a period of revolutionary change in agricultural methods. The original idea was the result of a quiet conversation between two farmers—one also a publisher and the other, one of our leading advertising agents—Mr. W. Leonard Hill on the one hand and his good friend, Mr. Bertram Ward, on the other. The idea was developed by two distinguished scientists, Sir E. John Russell, F.R.S., and Professor G. E. Blackman, F.R.S., and the master stroke was the appointment of Sir Harold Tempany, F.R.S., former Agricultural Adviser to the Colonial Office, to be its first editor.

The real purpose of this anniversary dinner was to bring together the leaders of the agricultural industries of Britain and the representatives of countries overseas which need to apply modern methods and use modern machines to increase and improve their agricultural production.

Frank Cooke, Editor of WORLD CROPS, *welcoming Air Vice-Marshal F. L. Hopps, Secretary of the Agricultural Engineers' Association*

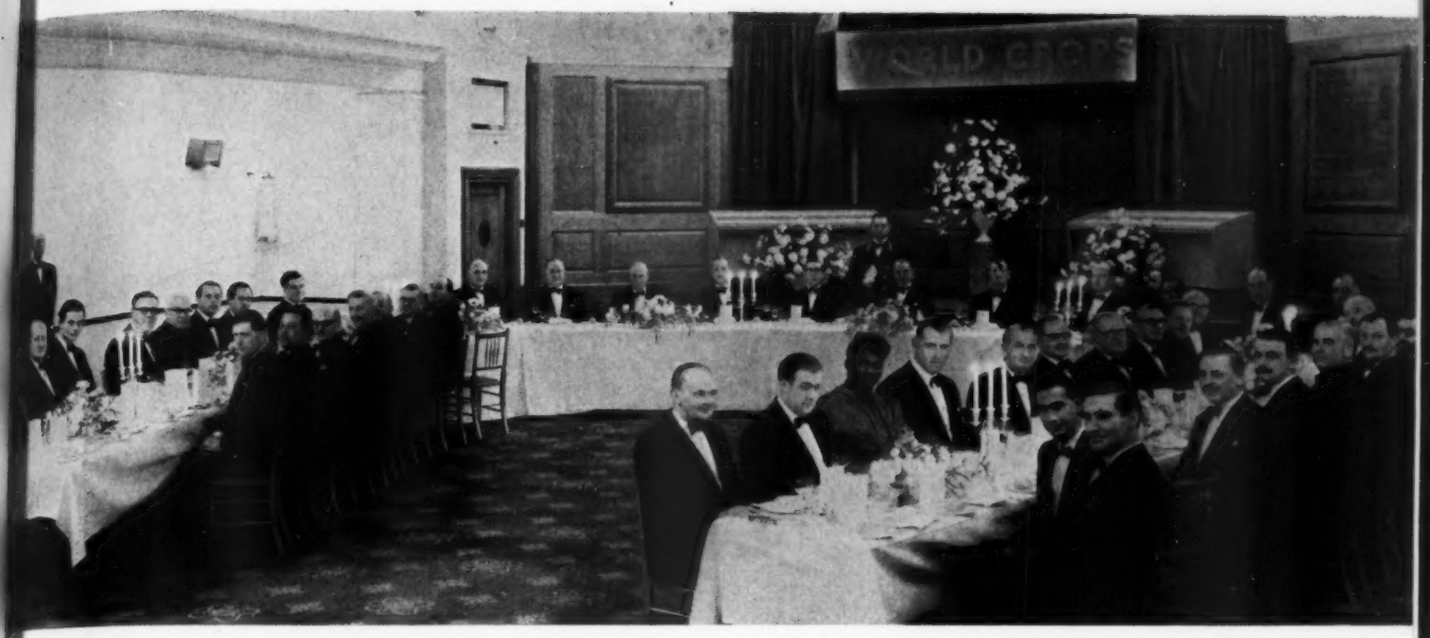
Included in the distinguished gathering was Sir Arthur Kirby, K.B.E., East African High Commissioner; Mr. J. L. B. Munro, C.B., C.M.G., of the Board of Trade; Mr. G. S. Bishop, C.B., O.B.E., of the Ministry of Agriculture, Fisheries and Food; Professor G. E. Blackman, F.R.S., Oxford University; Dr. F. C. Bawden, Director of Rothamsted Experimental Station; Dr. W. Davies, Director of the Grassland Research Institute; Tunku Ja'afar, Malayan Counsellor; Mr. V. E. Santiapillai, Trade Commissioner for Ceylon; Mr. A. Marinho, Brazilian Commercial Attaché; and Mr. R. L. Peel, Head of the Overseas Services Resettlement Bureau.

The meeting was addressed by the Editor of WORLD CROPS, Frank Cooke, who spoke on the promotion of overseas trade in agricultural machinery and chemicals, and Professor G. E. Blackman, who drew attention to the need for a cadre of experienced scientific men to serve in the newly self-governing territories. Replies were made by Mr. W. D. Akester, President of the Agricultural Engineers' Association, and Mr. V. E. Santiapillai, Trade Commissioner for Ceylon.

Mr. W. Leonard Hill, Chairman of the Leonard Hill Technical Group, welcoming Professor G. E. Blackman, of Oxford University, who was principal speaker at the dinner

An international group. Left: *M. Farinde, Commercial Counsellor for Nigeria.* Centre: *Mr. V. E. Santiapillai, Trade Commissioner for Ceylon.* Right: *Mr. P. A. Oram, Borax Consolidated Ltd.*

(*Reports of the three speeches may be seen on pages* 43 *and* 44)



'World Crops' Dinner on Thursday, 1 December, 1960, at the Royal Commonwealth Society, London

Outer Circle from left to right: Murray Pevan, *Advertisement Manager, 'World Crops';* R. L. Peel, *Overseas Services Resettlement Bureau;* J. Russell-Parsons, *Leonard Hill Technical Group;* M. N. Gladstone, *Fisons Pest Control Ltd.;* D. J. S. Hartt, *May & Baker Ltd.;* R. F. Edward-Collins, *Pan Britannica Industries Ltd.;* J. N. Hope, *Standardised Disinfectants Ltd.;* P. H. Prestt, *David Brown Ltd.;* F. C. Cooke, *Editor of 'World Crops';* M. W. Mawhinney, *Massey-Ferguson (Export) Ltd.;* Professor G. E. Blackman, *Oxford University;* H. C. Mellor, *President of the Association of British Manufacturers of Agricultural Chemicals;* G. S. Bishop, C.B., O.B.E., *Ministry of Agriculture;* W. Leonard Hill, *Chairman of the Leonard Hill Technical Group;* Sir Arthur Kirby, K.B.E., *East African High Commissioner;* W. D. Akester, *President of the Agricultural Engineers' Association;* V. E. Santiapillai, *Trade Commissioner for Ceylon;* J. L. B. Munro, C.B., C.M.G., *Board of Trade;* Senor A. Marinho, *Brazilian Commercial Attaché;* Captain E. N. Griffith, *Rotary Hoes Ltd.;* M. W. Rhoten, *Allis Chalmers (Great Britain) Ltd.;* H. W. Roberts, *Trade Commissioner for Rhodesia and Nyasaland;* G. C. Killpack, *Cyanamid of Great Britain Ltd.;* J. Lampson, *Ford Motor Co. Ltd.;* N. G. H. Thomas, *Monsanto Chemicals;* S. K. Garratt, *Shell Chemical Co. Ltd.;* E. V. Melder, *Commercial Counsellor for Ceylon;* J. H. W. Wilder, *John Wilder Ltd.*

Inner Circle from left to right: D. Montgomery, *Borax Consolidated Ltd.;* Tunku Ja'afar, *Trade Commissioner for Malaya;* H. Edgson-Wright, *Stanhay (Ashford) Ltd.;* F. W. Morris, *Fisons Pest Control Ltd.;* S. Magee, *Plant Protection Ltd.;* Dr. W. Davies, *Grassland Research Institute;* W. A. Williams, M.B.E., *Secretary of the Association of British Manufacturers of Agricultural Chemicals;* Air Vice-Marshal F. L. Hopps, C.B., C.B.E., A.F.C., *Secretary of the Agricultural Engineers' Association;* Dr. F. C. Bawden, *Rothamsted Experimental Station;* P. A. Oram, *Borax Consolidated Ltd.;* L. C. Pearch, *Kent Engineering and Foundry Ltd.;* G. H. Andrews, C.B., *Board of Trade;* E. N. Riley, *British Schering Ltd.;* G. R. W. Grantham, *Penney & Porter Ltd.;* M. Farinde, *Commercial Counsellor for Nigeria;* S. Carter, *Metallurgical Chemists Ltd.;* D. W. R. Sawer, *Advertisement Director, Leonard Hill Technical Group.*

Letters of Appreciation

The following are extracts from a few of the many letters of appreciation since received:

Mr. R. F. Edward-Collins—

Export Sales Manager of Pan Britannica Industries Ltd.

'We sincerely hope that you have successfully sown a seed which will bear fruit, helped undoubtedly through the medium of your excellent journal'.

Mr. H. C. Mellor—

President of the Association of British Manufacturers of Agricultural Chemicals.

'. . . the brilliant contacts I was able to make. . . . I am sure that your efforts to bring East and West together and vice versa will, in the long run, be of tremendous benefit'.

Mr. S. Magee—

Publicity Officer for Plant Protection Ltd.

'May I now say how much I enjoyed the Dinner and how useful it was in enabling us to contact people from other parts of the world who are interested in similar problems to ourselves. I am sure that your action in making these contacts possible can have done nothing but good and I would like once again to offer you my very sincere appreciation'.

Chicle

Chewing Gum from British Honduras

A. BOLT

CHEWING gum is not a modern innovation. The great Maya* civilisation in Central America enjoyed the habit for centuries before the Spanish *conquistadores* arrived. The Indians of New England taught the American colonists to chew the gum of the local spruce trees, and this type of chewing gum was actually marketed in the early 1800s; it was not, however, until the Central American gum base of chicle became widely known in 1860 that the habit spread throughout America and later to Europe.

The basis of chewing gum nowadays is still chicle, the white, resinous latex exuded by a tropical plant of the Sapotaceae family—the sapodilla tree, *Achras sapota*. Exporting this resin is an important part of the economy of Guatemala and British Honduras. In Guatemala, the trees are cultivated in plantations, but in British Honduras they tap the wild trees growing in the jungle lowlands. Recent figures show that about £130,000 worth of chicle and £3,000 of crown gum are exported from British Honduras annually. This crown gum comes from a similar type of tree and can also be used in the manufacture of chewing gum.

* Mayas: an important race of American Indians consisting of many nations resident in Central America at the time of the Spanish conquest (A.D. 1500 *et. seq.*).

The latex is tapped from the sapodilla tree by making a panel of slanting or 'v'-shaped cuts to a height of 30 ft.

Chicle collection

The trees are tapped during the wet months from July to February and, during this period, the *chicleros*, as the chicle tappers are called, live a hard life in the hot, humid jungle, far from their families. The *chiclero* is, however, an aristocrat among Honduran workers. In a country where small wage packets are the rule, he can earn as much as £15 a week with three months of the year at home doing no more than a little work in the garden.

The viscous latex exudes slowly from the cuts and passes down from slash to slash during the night

Chicle trees can be tapped three times only (every four years). The tree drains overnight and the *chiclero* 'walks' his trees the following day to gather the gum from small leather collecting bags tied to each tree into a large sack. The gum is boiled with water to remove foreign matter and, after the excess water has been driven off, the *chiclero* tests the mixture until he judges it ready to be poured into small, wooden moulds, lined with palm leaflets. He collects about one ton per season from 200-300 trees.

The viscous milk is guided by a small twig from the last cut into a bag tied to the trunk of the tree

After the chicle 'bricks' have set, the blocks of gum are loaded on to the backs of mules and carried through the jungle to the nearest road, which may be miles away, and his accumulated 'cache' there is eventually loaded on to a lorry. It is rare for any of the blocks to be stolen, for public opinion would consider this a very anti-social act.

The only woman producer, Mrs. Lizaraga, was of the opinion that, with world prices at the present level, planting chicle as an estate crop would not be a financial proposition. Her family for a couple of generations has collected chicle and she herself makes regular trips into the jungle to supervise operations.

The collected latex is boiled to remove foreign matter and coagulated in large iron pots and the water content is reduced to about 33%

The coagulated gum is kneaded and pressed into wooden moulds lined with palm leaves. The chiclero pats the resin down with soapy hands

The resulting blocks, called 'marquetas' each weigh about 25 lb. Here the collected 'cache' of chicle blocks are awaiting removal at the roadside

Home-made chewing gum is a rarity and published recipes can only serve as a guide, since if the block of gum is either too hard or too soft, the proportions need to be changed. A standard formula gives a 20% gum base with 19% glucose syrup, 60% sugar and 1% flavouring with mint, vanilla and other ingredients. The gum can be blended from 25 different latex products ranging from chicle and crown gum to paraffin wax and spruce gum, and even synthetic resins are now used. The ingredients are best worked in under pressure with suitable machinery. There are some 33 chewing gum factories operating in the U.S.A. and ten in Britain.

Sprinklers Save Water

In the course of a paper, read at the 4th Congress of the International Commission on Irrigation and Drainage, held recently in Madrid, Spain, Mr. C. S. Wright, managing director of *Wright Rain Ltd.*, said that, without irrigation, farmers cannot realise the full benefit of modern farming techniques. The increased use of irrigation in recent years was due to the growing recognition of the fact that supplementary water gives increased crop yields and improves the quality of agricultural and horticultural produce.

But technical improvements in methods of applying the water had undoubtedly accelerated matters. Outlining some of the advantages of sprinkler irrigation, he said: 'Field experience has proved that this system has a very high degree of efficiency, for, indeed, an evenness of distribution of up to 90% can be obtained and the amount of water used can be varied to suit different types of soil and meet the immediate requirements of the crop exactly.' It also avoided the local puddling and leaching which is inevitable with surface irrigation.

Because of this more efficient usage, a given quantity of water applied by sprinkler irrigation was 50% more effective than by surface irrigation. Otherwise expressed, the same amount of water, applied by sprinkler, could irrigate a larger area.

Trials had shown that sprinkler-irrigated cotton required an average of 2.2 acre-feet of water to produce two bales of ginned cotton; under the same conditions, 3.27 acre-feet of water applied by surface irrigation gave only one and a half bales.

The great increase in the use of water for irrigation has brought its problems in those regions where water is in short supply. Reservoirs, artificial lakes and 'tanks' need to be built to catch and conserve the rainfall to carry the farmers through periods of drought, but he was sure that better use can be made of the available supplies by more economical methods of application.

Irrigation in Nyasaland

The Nyasaland Government has made available a sum of £4,000 from the African Development and Welfare Fund for a rice irrigation project in the Fort Hare district.

Great importance was attached to the project, and it was hoped that the scheme might pave the way for larger projects in the future. The pilot scheme will initially cover an area of 150 acres.

Immature Nutfall of Coconuts

The War of the Ants

R. J. A. W. LEVER*

This is a very brief summary of work published on the problem of immature nutfall of coconuts carried out over several years by various people working under climatic conditions far removed from ideal.

BESIDES the normal shedding of young nuts, which is comparable to the 'June drop' of apples in England, the coconut palm sometimes also suffers from a fairly heavy nutfall of nuts older than the so-called 'button' stage. Among the first workers to study this problem was Gadd in Ceylon, who some 40 years ago published a paper[1] which dealt with such factors as drought, insufficient support of the bunch by the leaf bases, absence of pollination, inadequate nutrition and the fungus *Phytophthora*.

Nutfall in Melanesia

The first detailed studies of nutfall in the islands of the Pacific were by Taylor,[2] whose work in Fiji showed the remarkably high figure of nearly 72% due to general weakness of the palms, 8.8% from caterpillars of the *Tirathaba* moth, and 1.5% from rats. Although damage by this insect was also known in the Solomons, it was clear by the end of the 'twenties that some other factor was responsible for the severe losses being experienced in plantations on those islands.

Eventually, two scientists from the Fiji Department of Agriculture were loaned to the British Solomon Islands Protectorate, which was so poor that it had no agricultural staff of its own. After a brief visit in 1928, Tothill's report[3] stated that the chief offender was the shield bug, *Axiagastus cambelli*, said by him to be the most serious pest of coconuts in the Solomons. A similar suggestion, made by a local planter to Froggatt, had been noted in an Australian bulletin as long ago as 1911.[4] Further studies were recommended by Tothill and the writer was appointed entomologist and sole member of an agricultural department.

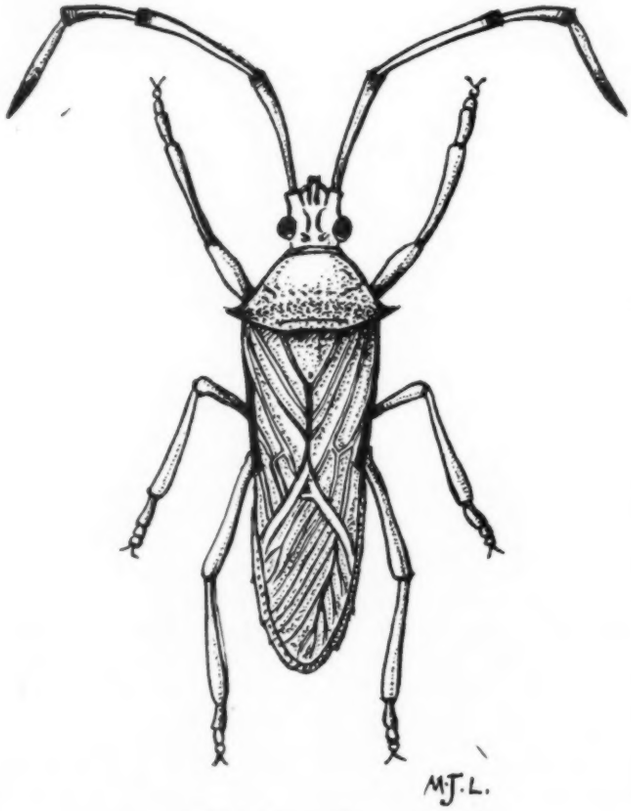
Early work

Visits throughout the planted areas in the Solomons soon showed that *Axiagastus*, even when present on the spathes in very large numbers, did not always result in nutfall, this being specially marked in the case of the Russell Islands. Detailed studies were then made of the insect fauna of the palm crowns, using platforms on tall scaffolding, but no other insect could be found in sufficient abundance to provide a possible cause of immature nutfall.

Accordingly the emphasis was shifted to an investigation of the climatic and edaphic factors previously suggested by Tothill, *viz.* lack of air and sunshine, excessive moisture and unsuitable soil, but no correlation could be found which could be linked with the nutfall areas.

Intensive collecting of the insects frequenting the crowns was repeated, native climbers carefully severed the recently opened spathes and lowered

* Former entomologist, British Solomon Islands Protectorate.



Amblypelta cocophaga. × 4

them to the ground on cords and the writer climbed selected palms on a rope ladder. Eventually a Coreid bug, previously found in very small numbers and provisionally identified in London as a species of *Dasynus*, was suspected as being the cause.

Using wire gauze cages hauled up into the palms, the canvas collar at the free end being lashed around the spathe, it was found that when this bug was introduced nutfall occurred; when the cages were empty and again excluded all insects, there was no nutfall. This bug, in the same family as the American squash bug, had by now been described as a new species of another genus, *viz. Amblypelta cocophaga*, and details of its ability to cause this condition were published in a local and short-lived journal with a very small circulation.[5, 6] These results accounted for the somewhat puzzling absence of nutfall from the Russell Islands, where *Amblypelta* was also absent, although present in islands to the north, east and west.

Later work on *Amblypelta*

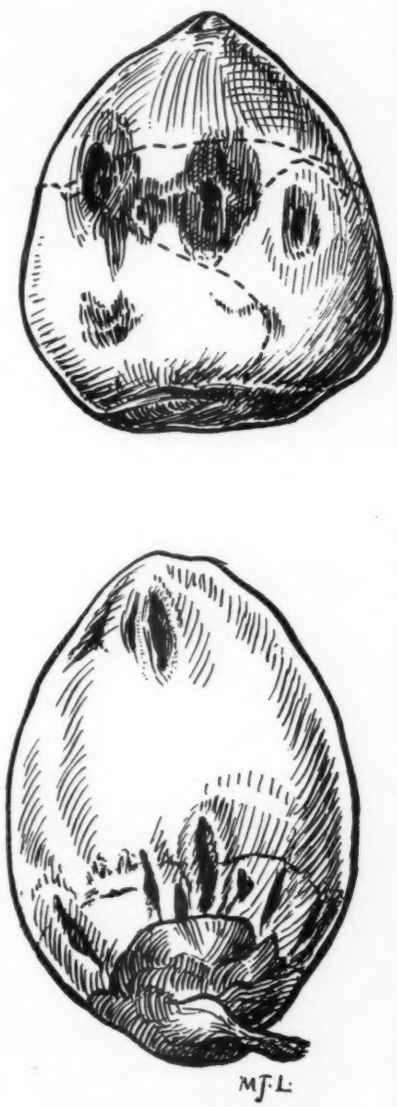
Small-scale tests in a frame-built hut which served as a laboratory proved that when severed fruiting branches of the coconut were placed in a nutrient solution and caged with a few bugs, there was a fall of the immature nuts, but no fall in the case of bug-free cages.[7] Further studies on this insect by Phillips[8] showed that with an observed population per palm of from only 0.85 to 1.92 individuals, nutfall occurred. The actual manner in which cracks appear on the surface of the nut as a result of punctures by the bug of the bracts was elucidated by Leach[9] and a useful article on the then current research was written by O'Connor.[10]

More recently an intensive study of the whole problem of nutfall has been carried out by Brown[11] after several years' residence in the Solomons. Although attempts had been made to check the insect by biological control, neither egg parasites introduced from Indonesia before the war nor a Tachinid fly from Australia after the war have become established, so that this method has proved unsuccessful.

The rival ants

For years it had been noticed that palms occupied by a large orange-yellow ant, *Oecophylla*, invariably bore good crops, while those in possession of two smaller species, *Iridomyrmex* and *Pheidole*, had practically no nuts. Naturally the ants themselves were held responsible for the nutfall, but the real explanation was that *Oecophylla* (and to a much less degree *Anoplolepis* ants) was able to attack or drive away the harmful *Amblypelta* bug, neither of the two smaller ant species being able to do so. In other words, the ants were indicators of the struggle in progress in the tops of the palms, but they did not by themselves cause the nutfall.

Attempts to spread the so-called friendly ant, *Oecophylla*, either by bodily transference of its silken nests or by using jungle lianes† to act as runways from palm to palm were not successful.



Injury by bug to nuts

Top: *Puncture marks are seen on the young nut. The dotted lines indicate perianth scales.* Bottom: *Older nut with deep scars and gumming*

Owing to the war in the Pacific, the Solomons between 1942 and 1945 became either active combat or occupation areas and all plantation work ended. On cessation of hostilities, however, a very interesting condition was found to have arisen in that many barren or poorly bearing areas had been reoccupied by *Oecophylla*, with a resultant return to good crops. The explanation of how this came about was not easily arrived at, as there were, of course, no observers during the critical years, and three theories were advanced to explain it.

The first hinged on the rank undergrowth, which became established in the plantations as a result of the inevitable neglect over three years, coupled with the large accumulation of fallen leaf fronds which were formerly collected and burnt. It was suggested that these fronds and jungle creepers, by acting as bridges, enabled *Oecophylla* to bypass the swarms of workers of *Pheidole* and *Iridomyrmex* and so gain access to the palms.

A second theory attributed the renewed bearing of the palms to the effect of routine aerial spraying of DDT in diesel oil as an anti-malarial measure and that this was effective on mosquitoes the writer can personally vouch. An obvious drawback here is that a differential effect by the insecticide is postulated to kill the smaller harmful ants and to spare the beneficial *Oecophylla*.

The final and most likely suggestion is due to Brown,[11] who suggested that certain unknown intrinsic factors caused a normal reduction in the population of *Pheidole*, thus enabling *Oecophylla* to become ascendant and recolonise former nutfall areas.

Nutfall in Zanzibar

For several years an unknown gumming disease had been a source of injury to coconuts in Zanzibar, Pemba and coastal Kenya. When critically examined in 1951 the cause was found to be a similar bug which was attended by similar ants, as in the Solomons. In fact, it was found by Way[12] that a hitherto undescribed insect, *Pseudotheraptus*, caused the same sunken

† Lianes or jungle ropes—a remarkable feature of primary jungle vegetation.

Left: *Wire cage with trap door and canvas base.* Right: *Cage being placed in position around spathe*

necrotic areas in the young nuts, which later developed into deep cracks.

The ensuing nutfall was quite distinct from the normal nutfall, due to shedding of excess nuts. Furthermore, clean cultivation of the plantations, or misuse of the soil, encouraged the harmful ant, *Pheidole*, thereby making more difficult the control of the bug by *Oecophylla*—the species of ants were different, but the genera the same as in the Solomons. Later work by Vanderplank[13] showed exceptionally low numbers of *Pseudotheraptus*, which when further studied by Yeo and Foster[14] gave only one immature nymph per palm, the distribution not being random.

The most recent study on this insect was done by Vanderplank,[15] who, by using 10 native climbers for six days a week over two years, proved that the numbers of the bugs collected varied greatly with the weather. More insects were found on dull than on bright days, as they shelter from strong sunshine as well as from heavy rain.

Here, therefore, is a most interesting parallel between the pest, its habits, injury, associated ants and general biology in islands off East Africa and 8,000 miles distant from Melanesia. The use of power sprayers applying gamma BHC or dieldrin shows every indication that the chemical control of these insects is likely to be brought about soon.

REFERENCES

1. Gadd, C. H.: *Dept. of Agric., Ceylon, Bull.*, 1922, No. 53.
2. Taylor, T. H. C.: *Dept. of Agric., Fiji, Bull.*, 1930, No. 17.
3. Tothill, J. D.: Reconnaissance Survey in the British Solomon Islands, 1929.
4. Froggatt, W. W.: *Dept. Agric. N.S.W. Sci. Bull.*, 1911, No. 2.
5. Lever, R. J. A. W.: *Brit. Solomon Is. Agric. Gaz.*, 1935, **3**, 4.
6. Lever, R. J. A. W., and Phillips, J. S.: *Ibid.*, 1935, Supplement.
7. Lever, R. J. A. W.: *Bull. Entom. Res.*, 1937, **28**, 325-331.
8. Phillips, J. S.: *Ibid.*, 1940, **31**, 295-316.
9. Leach, R.: *Progress*, 1949, **40**, 233 (Messrs. Unilever, London).
10. O'Connor, B. A.: *Fiji Agric. Journ.*, 1950, **21**, 1-2, 21-42.
11. Brown, E. S.: *Bull. Entom. Res.*, 1959, **50**, Pts. 1 and 3.
12. Way, M. J.: *Ibid.*, 1953, **44**, 657-691.
13. Vanderplank, F. L.: *Ibid.*, 1959, **49**, 559-584.
14. Yeo, P., and Foster, R.: *Ibid.*, 1951, 585-590.
15. Vanderplank, F. L.: *Ibid.*, 1960, **51**, 57-60.

NOTE FOR CONTRIBUTORS AND AUTHORS

The editor welcomes authoritative articles and news items on agricultural machinery and agricultural methods, agricultural crops and new developments.

It should bear the name and address of the author and be accompanied by sharp photographs or line drawings with suitable captions.

New High-Yielding Cotton Variety

A new variety of cotton, which was raised by the Experimental Station of the State University of New Mexico in collaboration with the U.S. Ministry of Agriculture, is to make a further increase possible in the yield per acre, according to reports from the University.

This new variety has received the designation 1517D and has now been released for general culture. It is to replace the type grown so far, Acala 1517C.

Numerous cultural experiments have shown that the new cultivar is in most cases superior to the old one. The young plants developed more vigorously, the time of ripening was generally earlier and the fibres are somewhat longer and stronger than those of the old variety. The quality of the yarn is also said to be better. The somewhat smaller seed capsules constitute no disadvantage if the crop is harvested mechanically. Its powers of resistance to the most important plant diseases is just as great as in the type Acala 1517C.

Progress in Weed Control

2—Improvements of Pastures and Hill Grazing

A RECENT survey has shown that there are nearly 7 million acres of permanent grassland in lowland England. Only 20% of this can be classified botanically as good grassland; 60% consists of *Agrostis* and ryegrass or *Agrostis* swards and 20% of fescue, *Nardus*, *Molinia* and rush-infested grasslands. The extensive areas of rough grazing on the uplands present an even greater problem.

There is a large acreage of unploughed permanent grassland (particularly of the *Agrostis*/ryegrass type), which, although infested with dicotyledonous weeds, also contains clover and some of the better grasses, *e.g. Lolium perenne* and *Phleum pratense*. Many of the dicotyledonous weeds in these neglected pastures can be controlled by spraying. Although this spraying may temporarily reduce the clover content, it should be possible to improve the sward gradually by encouraging the development of better grasses and the clovers, thereby eliminating the blank period of production which follows surface killing and reseeding.

The following is a brief account of the papers given in the third session of the Fifth British Weed Control Conference:

The farmer and a county advisory officer seen on the improved sward which has been closely grazed by sheep. A strip of untreated ground can be seen in the background

The Control of Weeds by MCPA in Permanent Pasture under Different Managements and the Effects on Herbage Productivity *by H. K. Baker, L. Jones and J. R. A. Chard* (*The Grassland Research Institute, Hurley*)

The object of the experiments was to study the long-term effects following the application of MCPA to permanent pasture infested with dicotyledonous weeds (particularly *Ranunculus repens* and *R. acris*) containing some clover and better grasses. Changes in herbage production and the botanical composition were studied under different nitrogenous and grazing treatments.

The results to date indicate that the control of weeds by the application of sprays alone does little to raise total herbage productivity. Nitrogen increased the quantity of grass present, although it also encouraged the development of undesirable weeds, *e.g. Circium arvense* and *Taraxacum officinale*. A combination of spraying and nitrogen was the best treatment for controlling weeds, although the clovers were depressed. The best responses to nitrogen occurred where all the plots were well grazed by stock. It thus appears that the control of weeds by spraying must be accompanied by application of nitrogen and the resulting extra grass must be adequately utilised.

The Use of Chemicals in the Renovation of Difficult Swards in the East Midlands of England *by J. F. Ormerod* (*National Agricultural Advisory Service*)

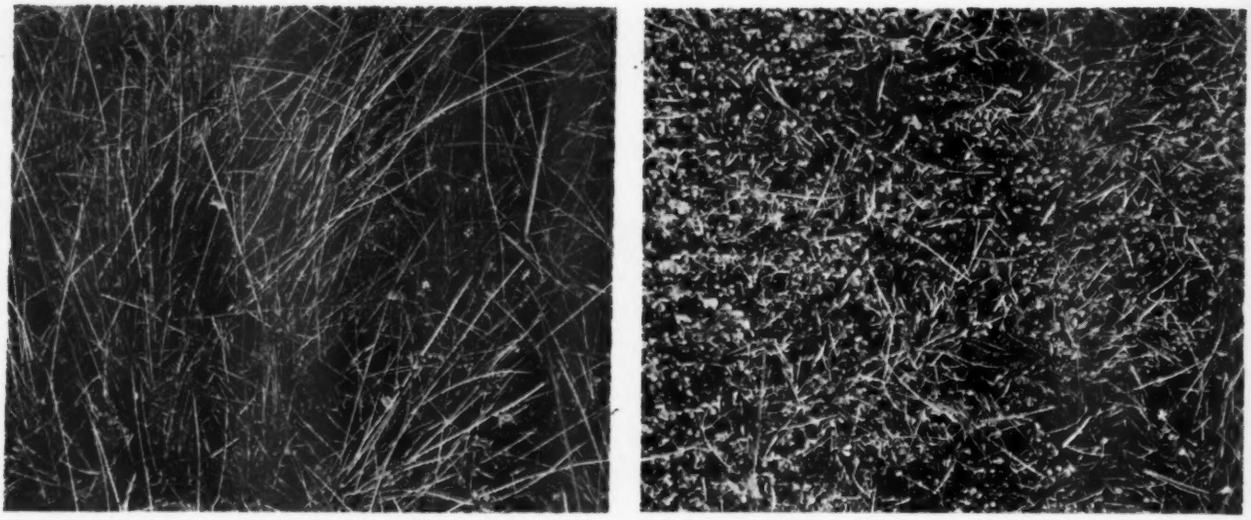
The purpose of the trials described was to develop a technique which could be used to improve grassland in the marginal and hill lands in Derbyshire. In this, as in similar areas elsewhere, the farms are mostly small, with limited capital, labour and machinery. It was hoped that reseeding after dalapon application would prove to be within the capacity of such farms and at least as satisfactory and consistent as conventional methods.

It was not regarded as an alternative to ploughing where that was practicable, but as a possible means of quickly improving the many thousands of acres of such land which for one reason or another were not suitable or likely to be ploughed.

The conclusions reached were that there were no appreciable differences between times of application in the degree to which the top growth of grass was killed initially. 15 lb. dalapon gave a complete kill of top growth and 7½ lb. about 80% kill.

There were, however, big differences between dates of spraying in the speed of regrowth after the initial kill of top growth. Recovery was rapid after late spring application and was practically complete after about six weeks on lowland sward. Recovery was much slower after the summer application and slower still after the autumn application.

Late spring was therefore a less satisfactory time for spraying as a pretreatment for reseeding because of the short period during which new seeds could establish before competition from the old sward began. The low-



Left: *The original sward composed of rushes, bent, meadow grass, crested dogstail, sweet vernal, perennial ryegrass and whiteclover. Sprayed in the autumn of* 1959 *with MCPA to kill the rushes. Two tons of lime and one ton of slag applied during the winter of* 1958. *Sprayed in April* 1959 *with* 3.75 *lb. dalapon per acre.* Right: *Close-up of improved sward taken in the autumn of* 1959 *shows elimination of rushes and remarkable spread of clover*

land sward reacted to the treatment much more rapidly than the hill sward, but also recovered more quickly.

A mixture of 2,4-D ester with dalapon was ineffective in controlling broad-leaved weeds at all times of application. These weeds spread rapidly after the kill of grass on the lowland sward and would have constituted a serious problem on a farm scale, since further spraying with M.C.P.A. also failed to control them.

For both technical and economic reasons it seems that the technique of pasture renovation with herbicides is likely to find less application in hill and marginal areas than at one time seemed probable. This view is based largely on difficulties inherent in the farming system and type of land and is therefore not likely to be greatly modified by improvements in chemicals or reduced costs.

Hill Pasture Improvement with Dalapon *by G. E. Davies, R. F. Hunter and J. King* (*Hill Farming Research Organisation, Edinburgh*)

This paper reports on six trials in which were studied the herbicidal effects of dalapon on hill pasture species, on its value as a pre-treatment to oversowing, and on its residual effect on the germination of sown species. The susceptibility of individual species, the effect of rate of application, time of spraying, time of sowing and the benefit of cultivation and burning on the establishment of the sown sward is reported.

The work was carried out in S.E. Scotland, where conditions, both of rainfall and pasture type, differ from those found in the West of Scotland. The lower rainfall and dense turf found on *Molinia* and *Nardus* swards in this area make the successful establishment of surface-sown seeds more difficult than where the rainfall is higher and the mineral soil is not covered by a 2-4-in. mat.

After improvement, hill swards are liable to revert. This reversion is more rapid the greater the proportion of original vegetation not killed by ploughing or by the dalapon pre-treatment. If the 'take' of sown species is good and their subsequent growth luxuriant, they may effectively compete with the hill species. This has not been the case in the trials now reported and, although a large proportion of some swards are now composed of sown species, the remaining hill species, mainly by selective grazing, are likely to spread at the expense of those sown.

Except in an almost pure *Nardus* or *Molinia* sward where 5 lb. dalapon per acre might suffice, serious competition can be expected from resistant hill species at all rates up to and including 20 lb. dalapon per acre, and the inclusion of a herbicide to deal with the dicotyledonous weeds would be necessary when they were present to any extent.

No satisfactory technique for treating the turf, killed or weakened by the dalapon, to improve the establishment of the sown species was found. There is no doubt that the pitch-pole harrowing greatly increased the effectiveness of the spray by tearing up plants of resistant species, principally *F. ovina*, temporarily weakened by the spray and also improved the establishment of the sown species, but this was not effective at all sites.

Due to the susceptibility of *Nardus* at all dates of spraying and to *A. tenuis* and *F. ovina* being susceptible at different periods of the summer, no differences were apparent in reducing the vegetative ground cover. For purposes of oversowing, however, autumn spraying, followed by spring sowing, would be preferable in the S.E. of Scotland, as autumn sowing might be followed by a severe kill of the sown species, especially clover, over winter.

Burning appeared to confer no advantage in establishing the sown species. It was found impossible to burn a sward in July which had been sprayed in May, but one sprayed in August burnt readily the following spring. Even in the driest weather it is impossible to reduce the tussocks by burning, although the dead grass lying above them can be burnt.

Improvement Studies on Festuca-Nardus and Calluna-Molinia Areas *by A. Rowlands* (*National Agricultural Advisory Service, Wales*)

The present sub-climax vegetation of hill grazings is the product of climatic, edaphic and biotic factors

which have been at work over a long period. In order to effect any change in the vegetation and maintain it, it is necessary to modify the soil environment and to effect some changes in the grazing management.

Surface improvement studies are described with reference to four hill sites in Wales where the management had been that normally prevailing on each particular farm. It is obvious that the pace of improvement using these methods is determined by (*a*) the native plant communities; (*b*) the livestock policy in the area; (*c*) the grazing management. The grazing animal is the most important element in this whole process.

These studies have shown that, particularly under conditions of open hill grazing where the fine-leaved *Festuca* sp. are present in quantity, they are strong competitors with any introduced species. If a greater measure of controlled grazing could be exercised, such as by fencing, this problem raises possibilities of solution.

Where the plant community is of an open type, such as Callunetum, there seems to be no difficulty in establishing a satisfactory sward from sown grasses and clover even without surface cultivations.

Following applications of lime and fertilisers, sown grasses established quite readily without surface cultivation on a Callunetum, *Calluna vulgaris*, community grazed by cattle. Satisfactory swards were produced within two years.

Similar treatments on a Nardetum community grazed by sheep gave a poor grass establishment with a low white clover content after four years. On a similar site grazed by cattle and sheep there was much better 'take' of white clover and this had developed quite strongly by the second year.

Where dalapon was used as pretreatment on Nardetum, a fairly good establishment of sown grass and white clover was obtained within 12 months of treatment, but the *Festuca* sp. present were only retarded by the herbicide and ultimately became the dominant grasses in the sward.

Use of Dalapon for Grassland Improvement in South-West Scotland *by A. L. Gardner (West of Scotland Agricultural College)*

Dalapon, with its grass - killing properties, has given grassland improvers a new weapon with which to attack the problem of renovating or replacing unproductive grassland. Trials have been carried out on areas where, for one reason or another, it was considered impossible or undesirable to plough; from a farmer's point of view this is the only outlet for this chemical in view of the present subsidies on ploughing and the certainty with which a seedbed can be obtained by ploughing.

It is concluded that where the establishment of sown seed is impeded by competition from existing grasses the use of dalapon to reduce or remove this competition will greatly help the establishment and spread of the better species. Although the technique is sound on technical grounds, the economics are open to question and may limit its use to swards that are readily killed by low rates of application.

Grassland improvement by selectively killing less desirable types with small doses, combined with accepted practices of good husbandry, shows promise. When more information becomes available on the relative tolerance of different species it may be possible to eliminate unwanted grasses without retarding the growth of the sward as a whole.

Study Tour in U.K.

Seventeen Swedish industrialists have been on a study tour in the U.K., organised by the Swedish Association of Metal-working Industries in co-operation with The British Engineers' Association and The British Electrical & Allied Manufacturers' Association Inc.

In the course of their tour they visited the factory of Rotary Hoes Ltd. They inspected the steel foundry, forge and machine shops and were shown a film in which Howard Rotovators were used in farming operations in the U.S.A.

The party of Swedish industrialists around a tractor-drawn Howard Rotovator. Left to right: *M. Brandstad; T. Barraclough, Director of Rotary Hoes Ltd.; U. Bonde; O. Bjorck; A. Egnell; G. A. Lindqvist; S. Lundberg; E. Soderberg; C. E. Blad; B. Lundin; G. Lindberg; A. Oqvist; F. P. D. Moore, Rotary Hoes Ltd.; N. Thuring; S. Tornebohm; O. L. Hising; S. G. W. Borgedahl; H. Lundgren; G. Johansson*

Use of Lignite in Agriculture

ING. C. COPPA-ZUCCARI*

PROFESSORS Capriotti and Cantarelli, of Perugia University, have announced the results of their investigations into the possible use of pulverised lignite as an ingredient of organic fertilisers.

They have examined the microbial flora of fine lignite and also of mixtures of lignite with farmyard manure; the development of various microbial groups—actinomycetes, bacteria and yeasts—in the water-soluble fractions of fine lignite, straw and sawdust; the rate of decomposition of lignite and straw in the presence of various nitrogen-bearing substances, such as ammonium sulphate, urea and calcium cyanamide; the capacity of fine lignite to fix ammonia in relation to microbial activity; and the nature of the degradation products resulting from such microbial activity.

Decomposing micro-organisms

From their results the following conclusions can be drawn: the whitish growths on lignite are mainly caused by *Streptomyces albus*, with a limited association of *Streptomyces griseus* and *Streptomyces violaceus;* the microbial content of a mixture consisting of 25% lignite and 75% dung is high, the values by the fortieth day and in the deeper layers being similar to those of pure dung.

In a mixture of sweepings (40%), dung (40%), lignite (17%) and phosphorite (3%) the maximum microbial content by the sixth month was the same as in dung of the same age; the highest concentrations of actinomycetes were recorded in the lignite layer with values higher than those noted in dung. The species usually found were: *Streptomyces melanosporeus*, *diastaticus*, *albus* and *griseus*.

Aerobic decomposition of straw

The micro-organisms in the lignite, as also in the farmyard manure, bring about the aerobic decomposition of straw. Under anaerobic conditions, too, in the presence of urea, the straw is similarly decomposed when inoculated with the actinomycetic growths on lignite. Similarly, the presence of lignite dust will assist the degradation of straw inoculated with farmyard manure.

The chemical analysis of fine lignite and its separation into various fractions resinous, alcohol and water-soluble celluloses, insoluble proteins and lignin reveal that it can, like peat, be the seat of micro-biological activity.

Reaction mechanism

The maximum activity, as measured by the production of carbon dioxide, was observed from inoculation with drippings; the notable feature in all the cases was the reduction in the amount of ammoniacal nitrogen and its conversion into nitric nitrogen and proteins. With the development of CO_2 there was also a diminution in the C/N ratio and of the content of water-soluble substances and hemicelluloses, with an increase in the fractions, soluble in alcohol and sulphuric acid, and also in insoluble residue.

Other important characteristics for the utilisation of fine lignite in the production of organic fertilisers are: the marked capacity, in relation to other materials, to retain the ammonium ion independently from the reaction of the solution, and the modifications in its structure according to the reaction of the medium. Thus in acid to neutral solution (pH from 4 to 7) lignite dust releases the mineral salts, and under conditions of higher pH it progressively loses its fibrous structure.

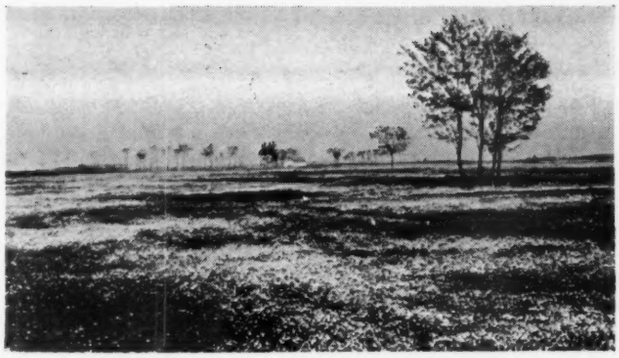
* Rome, Italy.

Parkland into Pasture

The story behind this picture has already been told. It is a story of the conversion of waste-land near Tunbridge Wells, Kent, England, into fertile farming land, see WORLD CROPS, 1957, **10**, 423, and 1958, **11**, 426. This picture shows the final result. In the foreground—with sheep in the field—is the 2nd-year grass. Beyond are this year's wheat and oat crops. In the stream-valley between, can be seen some of the original bracken which was left to hold the top-soil and prevent gullying.

Photo: By Massey-Ferguson, taken from a Fison's crop-spraying helicopter

Eridge Park, the seat of Lord Abergavenny



Left: *Large-scale cultivation of* Digitalis lanata. Right: *Camomile growing wild on the plains*

Medicinal Plants in Hungary

DIP.ING. L. HORVATH

THE healing effects of certain herbs has been known in Hungary for many centuries. Among the earliest books there is one by Peter Melius Horhi, a Calvinist minister, who produced his 'Herbarium' in 1578, and another by Beythe followed in 1595.

The climate is suitable for growing all kinds of herbs and in sheltered regions, there are medicinal plants which can only be found in the Middle East; some of the wild medicinal herbs special to Hungary are valuable because of their high content of active principle.

Commercial cultivation of medicinal herbs was started by Hungarian farmers at the end of the last century, and today production in co-operative and State farms is increasing year by year. Both the wild and the cultivated herbs are processed by a co-operative company, *Herbaria*, and the products are now being exported to some 25 countries.

Research and development

The collection and introduction, cultivation and improvement of herbal plants is the work of the Institute for Research on Medicinal Plants, which was founded in 1915. Besides carrying out agricultural research, the Institute is also developing machines and implements for the mechanisation of the industry necessitated by large-scale operations. The Director of the Institute, Mr. Tetenyi, has reorganised its work and has secured a farm, some 200 acres in extent, for field experiments. New administrative offices and laboratories are also being built.

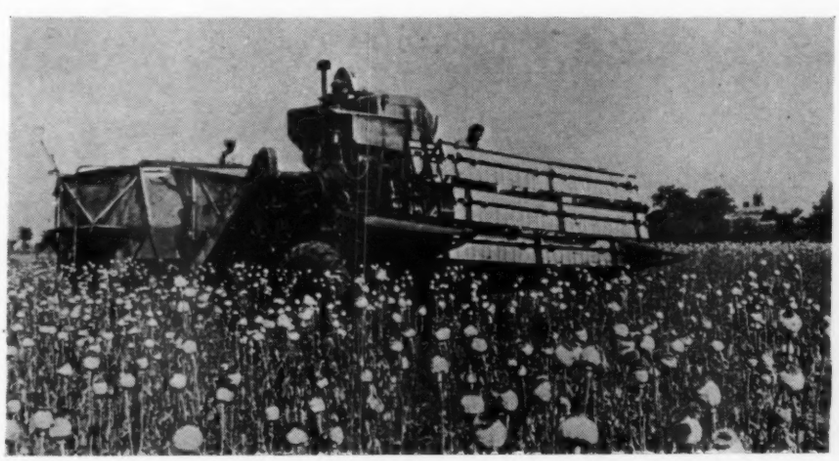
Plant introductions have been very successful and the cultivation of French lavender and English spearmint has considerably increased the exports of essential oils. Of all the medicinal products, the three most important are ergot, the opium poppy and the camomile.

Ergot

Ergot is not a plant, but a disease. It is the most serious and destructive disease affecting rye, *Secale cereale*. The fungus attacks the plant when it is in bloom in the spring and produces black or purplish bodies several times larger than the seed of an unaffected plant. The resulting black 'corn' contains the active material—ergot. This is the basic ingredient of medicines used to treat high blood pressure and haemorrhage during childbirth.

Formerly wild ergot was laboriously collected in the rye fields, and this made it scarce and expensive. Large-scale production became possible through the work of one of the research workers of the Institute, Dr. Bekesy, who demonstrated that rye can be infected artificially by inoculating the plant at the time of inflorescence with the spores of the ergot fungus, using a hypodermic needle.

This, too, was rather laborious, so he next produced a machine for treating whole heads of rye in the field. It



Harvesting and threshing the opium poppy

consisted simply of two parallel rolls, one rubber-covered and the other having sharp teeth. The teeth were dipped into the inoculant and several ears were infected simultaneously by drawing the heads of corn between the rolls. This prototype machine was hand-operated, but a motorised machine is now being developed. Harvesting is the same as for ordinary rye, but earlier; the black grains containing the ergot are subsequently separated in the thresher.

Morphine

Morphine and other alkaloids can be obtained from the opium poppy, *Papaver somniferum*, by making incisions in the capsules of the flowering head; the milky sap is scraped away and dried, a laborious and unsatisfactory process.

Mr. Kabay, who collaborates in the work of the Institute, has evolved an extraction process to obtain the morphine, leaving the seed to be used as food. His process is now being operated in other countries under licence.

The co-operative and state farms are now cultivating a variety of poppy which is particularly rich in morphine, and the total area so planted is over 22,000 acres.

A great deal of manual labour is involved in its cultivation: for thinning out, 10-12 man-days per acre; and for harvesting, about 10 man-days per acre. Mechanisation of thinning out is possible with the implements already available, but as harvesting of the poppy crop takes place at the same time as cereal harvesting extra machines will be required.

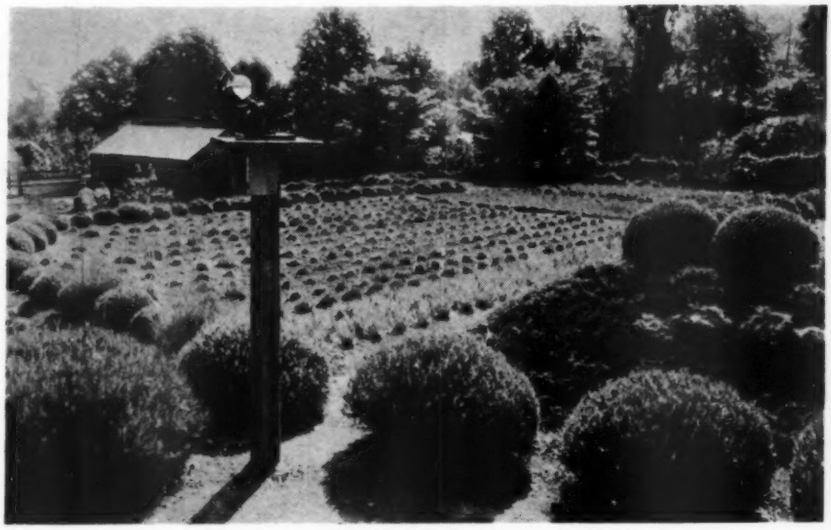
East Germany and Hungary are both working on special poppy combines. In the Institute the chief engineer, Mr. Balogh, and engineer Trefas are developing a machine which will be in production next year.

Camomile

Camilla hungarica is a Hungarian drug with a world-wide reputation because of its high active material content, due to the very favourable climate. The wild camomile grows over vast areas; it can be cultivated even on poor, sodic soils and also in rotation with rice.

In addition to the collection of wild camomile plants, about 25,000 farmers are engaged in the cultivation of the crop, but large-scale production is now being developed with increasing mechanisation. A suitable harvester has not yet been found. In the U.S.A. there is a harvester for pyrethrum, which is a similar crop, though much taller than camomile, and so is easier to cut and harvest. This machine draws the plants in and then two longitudinal rubber rollers tear off the flower heads. No doubt a suitable machine for the camomile will be found and two prototypes are already under test.

Solanum—a new medicinal herb being planted mechanically



Plot of lavender at the Research Institute for Medicinal Herbs

Determining the active content by an electronic apparatus

Other useful herbs

Solanum aviculare is a new drug, recently used for the production of

Large-scale cultivation of Solanum aviculare

medicinal hormones; it was introduced by the Institute and its cultivation is being extended. The seedlings are planted with tractor-drawn implements on which the operators sit.

Digitalis lanata, a foxglove, is a new variety which contains glicoside 'C', which is missing in the common *Digitalis purpurea;* it is a cardiac stimulant used widely for treating heart diseases.

Although many medicines are produced synthetically, natural substances produced from herbs are indispensable and increasing demand can only be met by large-scale production. Mechanisation of the cultivation and harvesting are essential for the proper development of the herb industry.

Technical News

The following articles appearing in the February issues of other journals in the Leonard Hill Technical Group will be of interest to our readers:

Manufacturing Chemist. — 'The Scent of Flowers and Leaves' by E. S. Maurer.

Dairy Engineering. — 'Mechanical Cheesemaking in Australia' by V. Czulak *et al.* of the C.S.I.R.O.

Food Manufacture. — 'Accelerated Freeze Drying' —two articles by J. M. Dalgleish and K. Ward.

Paint Manufacture.—' Cashew Nut Shell Liquid and Cardanol' by B. C. K. Marthy *et al.*

Specimen copes of these journals are available on application through our Reader Service.

Letter to the Editor

Sir,—In under-developed countries, such as Africa, or poorly developed countries, as in many parts of Asia, one of the main problems is the lack of mechanical power.

It appears that there are two major stumbling blocks which bar the path to mechanical development:

(*a*) The high initial cost which few individuals or even groups of farmers can afford.

(*b*) Ignorance, which results in the failure of modern equipment due to rough handling and lack of correct maintenance.

There are various means of overcoming the problems in paragraph (*a*) above, but paragraph (*b*) is a far more thorny one and finally revolves, not only on education, but also on the necessity to overcome ingrained laziness which is inherent in tropical peoples.

As there is insufficient time to awaken such people, I put forward the suggestion that a tractor be produced suitable for use by backward people. It is vital to aim for simplicity and I envisage a tractor with the following features:

(*a*) An inertia starter similar to those used by Italian military diesel lorries during the last war. By starting the engine in this way we eliminate the need for a starter motor, its batteries and the dynamo. (Needless to say, any sort of lighting equipment is not necessary and by eliminating these electrical units waterproofing - cum - protection from damp becomes virtually unnecessary in areas of heavy rainfall.)

(*b*) No hydraulics or p.t.-o. These are very useful with some types of equipment, but are not necessary when tackling the basic jobs of ploughing, subsoiling and harrowing.

(*c*) Front and rear wheels set to a standard span and not adjustable.

(*d*) Dry-type air cleaner, as an oil bath that is empty is useless.

(*e*) All maintenance points painted red and simple sketches to accompany the tractor, showing diagrammatically what has to be done.

(*f*) In general, sturdy straightforward construction with absolutely nothing fancy.

If a tractor of this sort could be produced, it would, in fact, be cheaper than any machine now on the market and far less costly or troublesome to maintain.

I feel sure that many leading firms now producing tractors would shudder at the thought of going back some 30 years, but I do believe that there is a real need to produce something simple and sturdy for use by indigenous peoples in tropical areas — a vehicle, furthermore, that perhaps a sound Government would also subscribe towards, by loan or subsidy, in the knowledge that the money so spent would not shortly be lying idle and rusting to scrap.

I do apologise for a somewhat lengthy discourse on this subject, and I trust that it is not a matter to which careful consideration has already been given. I would be most interested to hear comments on this proposition.

MAJOR G. O. HUGHES.

P.O. Box 120,
Kiambu,
Kenya Colony.

Record Rubber Planting in Dominican Republic

With a programme for 1960-61 for the distribution of 200,000 rubber tree stock, the Dominican Republic Department of Agriculture is giving special encouragement to the expansion of the rubber industry. Already 148,000 trees between one and six years old have been established and two factories have begun production. Operations are confined to the rainier north-eastern region of the country and the trees are serving the additional purpose of providing shade for coffee and cocoa crops. Previously, varieties of trees of no commercial value were used.

Coming Events

Power Farming. — The National Power Farming Conference is to be held in the Dome, Brighton, England, from 7-9 February. Overseas visitors and students are particularly invited. There is no charge for admission, but tickets are required. These, and further details may be obtained from the Organiser, Dorset House, Stamford Street, London, S.E.1. Telephone: Waterloo 3333.

Farming and Country Planning.—A course of eight evening lectures has been arranged by the Department of Extra-Mural Studies, University of London and the Association of Agriculture on the subject of 'Farming and Country Planning'. The lectures, which began on 18 January, will be given each Wednesday evening until 8 March at 6.30 p.m. at the London School of Hygiene and Tropical Medicine, Keppel Street, London, W.C.1. The fee for individual lectures is 2*s.* 6*d.* Applications should be sent to: The General Secretary, The Association of Agriculture, 53 Victoria Street, London, S.W.1.

Horticulture.—The Chelsea Flower Show will be held at the Royal Hospital, London, from 16-19 March. Particulars may be obtained from the Royal Horticultural Society, Vincent Square, London, S.W.1.

An International Exhibition of Flowers and Plants is to be held in Turin from 28 April-7 May. Details may be obtained from the Fiori del Mondo a Torino, Esposizione Internazionale, Via Pomba 23, Turin, Italy.

Cocoa.—The FAO Cocoa Study Group is to hold its fourth session in Abidjan, Ivory Coast, during March.

Sugar.—An International Sugar Exhibition will be held in Amsterdam, Holland, from 10-19 April. Enquiries should be addressed to International Sugar Exhibition, Marnixstraat 380, Amsterdam.

Refrigeration and Air-Conditioning. —The International Refrigeration and Air-Conditioning Exhibition is to be held at Earls Court, London, from 11-14 April, 1961. Details may be obtained from Patrick Smyth, 1 Crane Court, Fleet Street, London, E.C.4.

Fertilisers.—The Fourth Congress on Fertiliser Problems will be held at Opatija, Yugoslavia, from 9-12 May, 1961. This congress is organised every fourth year by C.I.E.C. (Centre International des Engrais Chimiques) and C.I.T.A. (Confédération International des Techniciens de l'Agriculture). Agronomists from all over the world will attend and papers covering the following subjects will be given: fertility of Yugoslavian soil and the use of fertilisers; evolution in production and consumption of fertilisers; adaptation of fertilisation to the needs of various crops; research in use of compound fertilisers; application of isotopes in fertilisation research; influence of irrigation on mineral fertilisation. Applications should be sent to: Secretariat General, C.I.E.C., Beethovenstrasse 24, Zurich, Switzerland.

Grain Storage.—A joint FAO and C.C.T.A. (Commission for Technical Co-operation in Africa) meeting on Grain Storage will be held in Accra, Ghana, during April.

Grain.—The sixth session of the FAO Group on Grains will be held in Rome during May.

Wheat and Barley.—The seventh FAO meeting on Wheat and Barley Improvement in the Near East will be held in Beirut, Syria, during May.

Plant Exploration and Introduction. —A Technical Meeting on Plant Exploration and Introduction will be held in Rome from 10-20 July.

Agricultural Exhibitions

Belgium.—The 41st International Agriculture and Agricultural Machinery Exhibition will be held in Brussels from 12-19 February. Details from Salon de l'Agriculture, 29 rue de Spa, Brussels.

Canada.—The National Salon of Agriculture will be held in Montreal during February. Details may be obtained from the National Salon of Agriculture, 10819 St. Denis Street, Montreal, Canada.

Egypt.—The World Agricultural Exhibition to be held in Cairo will now take place from 21 March-20 April and not from 15 February-30 March, as previously announced. Details from the Exhibition Committee, Central Ministry of Agriculture, Cairo.

France.—The International Agricultural Machinery Exhibition will be held in Paris from 7-12 March. Particulars from the Salon International de la Machine Agricole, 95 rue Saint-Lazare, Paris 9e.

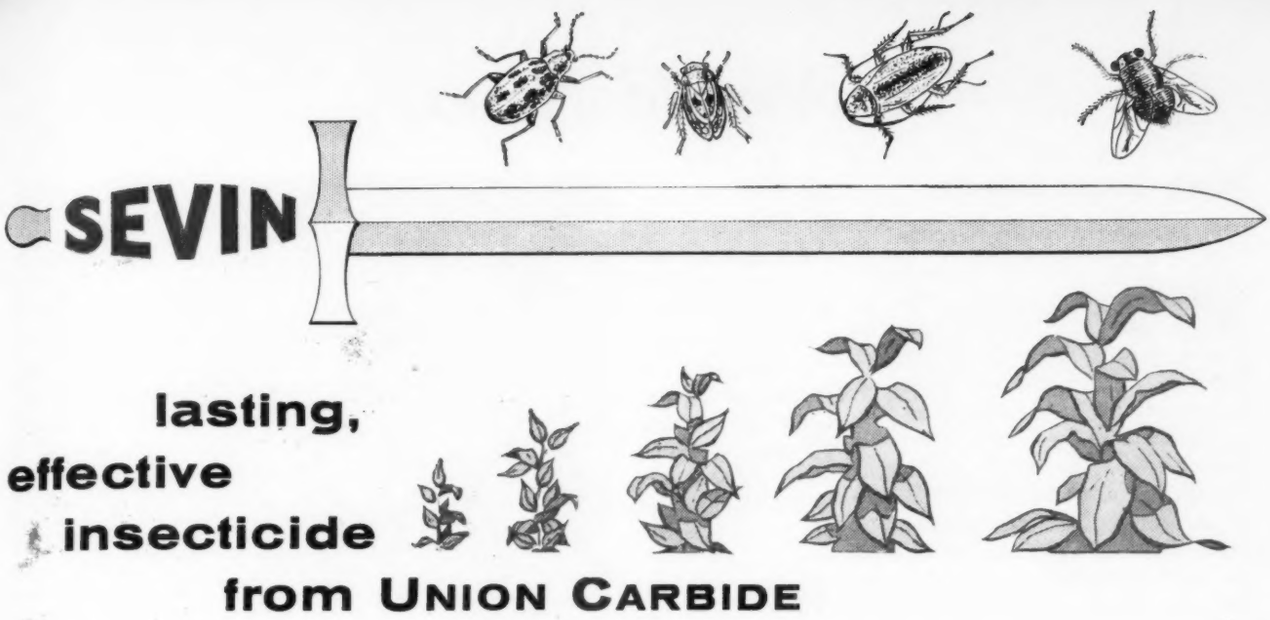
Italy.—The International Agricultural and Animal Farming Fair will be held in Verona from 12-20 March. Further details may be obtained from Secretary-General, International Agricultural Fair, Palazzo del Pallone, Verona.

South Africa.—The Rand Easter Show will be held from 21 March-3 April. Enquiries should be sent to the Witwatersrand Agricultural Society, P.O. Box 4344, Johannesburg.

Yugoslavia.—The 28th International Agricultural Fair will be held in Novi Sad from 29 April-8 May. Further information may be obtained from Novosadski Sajam, Hajduk Velkova 11, Novi Sad.

S. Rhodesia.—A Central African Trade Fair and Exhibition will be held in Bulawayo from 3-14 May. Details from the Development Officer, Bulawayo Agricultural Society, P.O. Box 1776, Bulawayo.

Sweden.—A European Agricultural Fair will be held in Jonkoping from 25 May-4 June. Further details may be obtained from the European Agricultural Fair, Jonkoping, Sweden.



lasting,
effective
insecticide
from UNION CARBIDE

SEVIN is a highly effective new insecticide which gives excellent control of most insect pests on a wide variety of crops and livestock and has long residual activity.

For example: in tests to date, 25-day-old SEVIN Insecticide residues killed 100% of exposed pink bollworms (*Pectinophora gossypiella*). 35-day-old SEVIN residues killed every exposed beetle (*Popillia japonica*). Other available insecticides were less effective or not effective at all. Cattle dipped in a suspension containing SEVIN Insecticide remained free of ticks (*Boophilus, Amblyomma, Rhipicephalus* sp.) for many days.

Deadly to a very wide range of destructive insects, even types resistant to DDT, other chlorinated hydrocarbons, phosphates, and other types of insecticides, SEVIN Insecticide is boosting crop, milk, egg, and meat yields for farmers around the world. Such wide-range effectiveness saves the extra cost of multiple insecticide combinations. SEVIN Insecticide is safer to handle than many other insecticides...tests indicate that it is less toxic than DDT.

The Union Carbide Corporation researchers who developed SEVIN Insecticide provide agriculture with a growing list of other fungicides, fly repellents, fumigants, and weed killers. For the name and address of your nearest distributor, and to find out how he can help you boost farm profits, write to Box CWO-2, Union Carbide International Company, Division of Union Carbide Corporation, 270 Park Avenue, New York 17, New York, U.S.A.

UNION CARBIDE

Chemicals

*The terms SEVIN and UNION CARBIDE are trade marks of Union Carbide Corporation

World News

South Pacific Islands

Coconut Industry Grants

The South Pacific Commission approved a further grant of £2,000 for 1961 to assist the Coconut Research Station which has been set up on Rangiroa, in the Tuamotu Group, to find practical ways of improving coconut production. The Commission will assist four coconut experts working in the Pacific to attend the symposium on the improvement of tropical crops being convened by its executive officer for economic development, Dr. Jacques Barrau, as part of the Tenth Pacific Science Congress to be held in Honolulu, Hawaii, in August and September 1961.

Kenya

Research on Coffee Disease

A grant of £21,235 has been made from Colonial Development and Welfare funds towards the cost of research on two important fungal diseases of coffee—coffee leaf rust and berry disease. The grant will meet half of the estimated cost of research over the next two years, the other half being met by the Kenya Coffee Board. The annual cost to Kenya of the two diseases is believed to be very high indeed, for on one 300-acre plantation last year damage by coffee berry disease alone amounted to £40,000.

Israel

Increased Agricultural Production

Israel's farm production from October 1959-October 1960 is reported by Barclays Bank D.C.O. to have reached the remarkable total of I£900 million. This is an increase of I£100 million over the previous year.

Fruit growers affiliated to the co-operative movement, who produce up to 80% of the national fruit crop, excluding citrus fruit and grapes, received I£45 million during the past year, which compares with I£30 million the year before. The harvest this year constituted a 45% increase in volume over that of last year.

U.K.

Sir Alexander Fleck, K.B.E., who opened the highly successful Corrosion Exhibition in December, is here seen at the stand of Corrosion Technical Services Ltd. and Soil Mechanics Ltd. Left to right: Sir Alexander Fleck, O. W. Leach (Corrosion Technical Services Ltd.), Mallam Matambari (Parliamentary Secretary to the Nigerian Ministry of Works), Alhaji Mettenden and W. Leonard Hill, Chairman of the Leonard Hill Technical Group, organisers of the Exhibition. Visitors from 25 countries visited the Exhibition, where many products of direct interest to the farming community were on display (see WORLD CROPS, 1960, **12,** 388 and 418).

[*Sir Alexander Fleck was included in the New Year's Honours and was made a baron, and Mr. Tom Williams, former Minister of Agriculture, who opened the Crop Protection and Pest Control Exhibition organised by* WORLD CROPS *in* 1958, *became a life peer.—Ed.*]

Japan

Highest Fertiliser Consumption

Because of the heavy density of population and the relatively small area of agricultural land, Japanese agriculture is compelled to produce the greatest possible quantity of food per acre. Since animal husbandry is only on a limited scale, there is little grassland and fodder cultivation in Japan. A third of the total cultivated area is occupied with rice, one of the most intensively worked crops. In addition, mainly wheat and barley (about 20% of the agricultural area), legumes (about 15%), as well as fruit and vegetables (8-10%), are grown.

The average yields per unit area are very high. Apart from the ability and diligence of Japanese farmers, these are the result in the first place of heavy mineral fertilising with nitrogen, phosphoric acid and potassium. The average consumption of mineral fertilisers is 98 lb. nitrogen, 56 lb. phosphoric acid and 67 lb. potassium per acre. Thus the highest and most intensive fertiliser treatment in the world is used in Japan.

India

Radio-Isotopes in Entomology

Dr. H. J. Bhabha, chairman of the Indian Atomic Energy Commission, told the five-day International Symposium on Radio-Isotopes and Radiation in Entomology in Bombay, that radio-isotope techniques had ushered in a new era in scientific thinking. He referred to progress made by the Commission's establishment at Trombay in the production of isotopes and their supplies to centres which needed them, and said that when the Canada-India reactor went into full production India would have one of the largest producers of radio-isotopes in the world.

One project was for the use of radiation for disinfestation of stored grain. In certain cases where conventional insecticides were not sufficiently effective it might be possible to eradicate the pests by what was known as the 'sterile male' technique. This technique was based on making male insects sterile through use of radiation and releasing them among insect populations to prevent further breeding.

New Publications

Weed Control

Issued by the Weed Control Council and edited by Dr. E. K. Woodford. Pp. 288. Blackwell Scientific Publications, Oxford, 1960. Price 17*s.* 6*d.*

The Weed Control Handbook was first published in a cloth-bound edition in 1958, and this is the latest revised edition which includes a number of new agricultural chemicals and explanatory plant diagrams. The tolerances or safety limits have been brought up to date and there is a new section on the law concerning injurious weed seeds.

In his introduction, Dr. H. G. Sanders, Chief Scientific Adviser to the U.K. Ministry of Agriculture, states that the book is intended for *all* who are interested in the practical or the technical aspects of the subject and the aim has been to make the volume complete.

Thus it deals with those weedkillers which are established in use and also gives the available information about those which are not yet fully proven, their chemistry, their effects and recommended dosages. The book also lists the weeds and their susceptibilities, the crops and their resistances. Methods of application of herbicides are described and sections are devoted to such matters as spray drift and the legal aspects of herbicide use.

This vast compendium of knowledge is a practical book of reference which should be ready to hand on the desks of every botanist, agronomist and crop specialist and in the offices of every field officer, planter and farmer—it is not a book which should be lost in a library, which may seldom be visited. It is a book which must be ready to hand and frequently consulted.

F. C. COOKE

Pest Control Methods

Chemical and Natural Control of Pests by E. R. de Ong. Pp. 244. Reinhold Publishing Corp., New York, 1960. Chapman and Hall Ltd., London. Price 60*s.*

This important contribution to the study of methods of combating pests by natural and chemical means will be of immense value to present workers in this field and to those whose task it is to impart up-to-date knowledge of the subject to students.

The author has assembled in a very readable form apparently all that is known at present about parasites, predators, climatic factors, both favourable and adverse, and about those plants which have shown a resistance to them.

In the category of pests, the author has not restricted his study to insects and arachnids only, but he deals also with weeds, viruses and mammals.

With the growing world population, and the consequent increasing number of mouths to be fed, it is hardly necessary to point out that the maximum amount of foodstuffs must be produced. To do this it is obvious that effective methods of control of factors likely to cause a decline in food production must be practised.

The author very wisely points out that the excessive use of chemicals may lead to the destruction of beneficial insects, for example, those responsible for pollination, and may also lead to the building up of immunity or resistance to chemicals.

In the introduction the author states that the farmer and commercial gardener does not view with equanimity the sacrifice of a considerable quantity of his crop to pests and diseases. There is, however, one aspect of the matter which he appears not to have considered. This is, that in the event of a bumper crop being obtained, a glut ensues and market prices fall; thus the amount of money spent in control measures might exceed that received from the sale of the crop. It is of fairly frequent occurrence that a crop is not worth harvesting and distributing.

Also included in this valuable book are chapters dealing with household and stored product pests. An appendix of chemical names of pesticides is also supplied.

N. C. E. MILLER

Technical Books

308 Euston Road

London, N.W.1

(Tel: EUSton 5911)

as retail booksellers will be pleased to supply any books reviewed in this periodical, and will give immediate attention to any requirements you may have for other works

(Trade not supplied)

Fertilisers and Manures

By Keith Paisley. Pp. 208. W. H. & L. Collingridge Ltd., London, 1960. Price 30*s.*

This is a book about feeding horticultural crops—vegetables and fruit and crops under glass. Although the opening chapters deal with the general principles of plant nutrition and improving soil fertility, it is not a book about the use of fertilisers and manures in general farming. It is a valuable contribution to the technical library, for too many books dealing with market garden crops have had some bias towards 'muck and mystery'.

The author discusses manures and organic and inorganic fertilisers with admirable balance. Very rightly, since they are more used in horticulture than in farming, he gives much attention to organic materials like dried blood, fish meal, hoof and horn etc., providing data about their rates of action, knowledge that has hitherto been assumptive rather than based upon actual measurement.

Mr. Paisley presents his crop-by-crop recommendations very concisely in the last quarter of his book. By the time the reader reaches this practical section he should know *why* and can therefore be told *how*, and there is no need for the all too common confusion of many variations of recipe. Liquid and foliar spray feeding are discussed; so, too, are frits and chelates for trace nutrient applications. The importance of pC as a soil value is also discussed.

A remarkably full coverage of basic and up-to-date knowledge has been achieved in just under 200 pages of lucid text, and the author is to be congratulated for handling so systematically a subject treated more often far too empirically.

D. P. HOPKINS

Manioc in Africa

By William O. Jones. Studies in Tropical Development, No. 2. Pp. 315. Maps, charts, index. U.S.A.: Stanford University Press. England: Oxford University Press. 1959. Price 54*s*.

The study of African production, consumption and trade in tapioca proved a challenge to Prof. Jones because information concerning the crop in Africa was inadequate, confused, sometimes contradictory and available statistics were insufficient and unreliable. The author has exercised great care in handling these fragile statistics, a self-imposed task which enhances the authority of his statements and conclusions.

In this book a description is given of the manioc plant, its introduction from South America to Africa and its distribution in the various regions where it has found general acceptance. The ease with which manioc can be grown, its high yield and suitability for poor soils, its resistance to drought and locusts, and its value as a famine crop, suggest it as a major food source. Methods of cultivation and preparation for consumption are described in some detail, the account ending with an appraisal of the present position of the crop and its possible future in the developing economy of Africa.

Prof. Jones is obviously greatly impressed by the importance of manioc in the nutrition of peoples living in almost every section of Africa south of the Sahara and Ethiopia and north of the Zambezi. He writes in defence of the crop in face of criticisms that it impoverishes the soil, causes erosion and is inadequate as a staple food. He meets these objections by insisting that soil impoverishment and erosion are not defects in the crop, but in the systems of agriculture under which it is cultivated.

He agrees that manioc is a starchy staple that provides only a small part of the protein requirements and only trivial amounts of most vitamins. This, however, he contends, is no reason to condemn it. Manioc is significant dietetically because it supplies food energy; its deficiencies should be made good by the addition of other foodstuffs. African diets are usually deficient in proteins, fats and vitamins because of the inability of the African to afford a better diet. In the author's view, the crop can be expected to provide a substantial proportion of food calories over much of tropical Africa in the foreseeable future.

The present reviewer has found this book of absorbing interest. It is an important contribution from that brilliant team of economists at the Stanford Food Research Institute and as such should be closely studied by those concerned with the development and well-being of Africa.

D. H. GRIST

Farmers of India

Vol. I—Punjab, Himachal Pradesh, Jammu and Kashmir, by M. S. Randhawa and Prem Nath. Pp. 309. Illus. Indian Council of Agricultural Research, New Delhi, 1959. Price Rs. 14.00, Sh. 27, $4.

This book provides a proper understanding and appreciation of problems of the farmers of India, so essential in formulating development plans and their successful implementation.

Volume I gives a vivid portrayal of the farmers of Punjab, Himachal Pradesh, and Jammu and Kashmir. The climate, topography, soils, vegetation, crops and agricultural practices are described in detail. The book also tells us about the farming communities, their villages, homes, culture, way of life, beliefs and traditions. The account shows profound understanding of rural life, the beauty of the landscape and the mood of the people, making it an intensely human document.

Volume II of the series, by M. S. Sivaraman, M. S. Randhawa and Suresh Vaidya, which is under print, deals with the farmers of Kerala, Madras, Andhra Pradesh and Mysore. The farmers of Eastern States of India are dealt with in Volume III by M. S. Randhawa, Ashok Mitra and Gisela Mehta. The subsequent volumes will cover other regions of India.

FAO Publications

Annual Review of World Production, Consumption and Trade of Fertilisers (for 1959). Pp. 140. Price $1.50 or 7*s*. 6*d*.

National Grain Policies. Supplement No. 2, 1960. Pp. 113. Price $0.50 or 2*s*. 6*d*.

Food and Agricultural Legislation. Vol. IX, No. 1, September 1960. Eleven leaflets and index. A quarterly series published in three separate editions, English, French and Spanish. Subscription per copy (four issues) $3.50 or 17*s*. 6*d*. Price per single copy $1 or 5*s*.

Agricultural Machinery Workshops: Design, Equipment and Management. Pp. 112. Price $1 or 5*s*.

Radioactive Materials in Food and Agriculture. Pp. 124. Price $1.50 or 7*s*. 6*d*.

An Enquiry into the Problems of Agricultural Price Stabilisation and Support Policies. Pp. 235. Price $2.50 or 12*s*. 6*d*.

Food Additive Control in the United Kingdom. Pp. 52. Price $0.50 or 2*s*. 6*d*.

Choice of Tree Species. Pp. 308. Price $3.50 or 17*s*. 6*d*.

All the above publications are obtainable from H.M. Stationery Office, P.O. Box 569, London, S.E.1, or through local sales agents. Payment may also be made in local currencies.

Bulletins and Reports

U.K. Ministry of Agriculture. 'Agricultural Statistics 1958-1959—England and Wales'. Pp. 150. Obtainable from H.M. Stationery Office, P.O. Box 569, London, S.E.1. Price 8*s*. 6*d*.

Forestry Commission. 'The Status and Development of Elm Disease in Britain, by T. R. Pearce, M.A. Bulletin No. 33. Pp. 44. Obtainable from H.M.S.O., address as above. Price 10*s*.

U.K. Central Youth Employment Executive. 'Choice of Careers, No. 85—Agriculture and Horticulture Managerial and Technical Posts'. Pp. 40. Obtainable from H.M.S.O., address as above. Price 1*s*. 3*d*.

University College of Wales, Welsh Plant Breeding Station. 'The Herbage Production of Two Strains of Perennial Ryegrass' by R. Hughes, M.SC.

Ontario Department of Agriculture. 'Raspberries and Blackberries in Ontario'. Publication No. 473, revised June 1960. Pp. 43. Obtainable from the Ontario Department of Agriculture, Parliament Buildings, Toronto, Canada. Price not stated.

Northern Ireland Ministry of Agriculture. 'The Research and Experimental Record of the Ministry of Agriculture, Northern Ireland'. Vol. IX, Part 1. Pp. 106. Obtainable from H.M. Stationery Office, 80 Chichester Street, Belfast. Price not stated.

Harvesting Uganda's 'Green Gold'

Machinery and Equipment

Tractors for Sugar

Uganda's sugar is described in 'Horizons' by the *International Harvester Export Co.* as 'Green Gold'. The pioneer of the industry is Nanji Kalidas Mehta, who, shortly after World War I, cleared land and drained swamps near Kampala and in 1924 opened the first sugar factory. When coffee prices dropped in 1929 a second sugar estate was founded by Muljibhai P. Madhvani, and today these two plantations produce well over 60,000 tons of sugar a year.

The northern shores of Lake Victoria are ideal for sugar-cane, because the rainfall of 40-50 in. is normally well distributed over the year. Such is the importance of water in sugar production, however, that artificial rain-making is resorted to whenever the rainfall falls below average and supplemental irrigation, using water pumped from Lake Victoria, is also under consideration.

Up-to-date practices result in yields of 40-45 tons of cane per acre with a yield of 1 ton of sugar from 10 tons of cane. Research includes the trial of new plant strains, the use of fertilisers and improved cultural methods.

Still further expansion is planned by the industry and African farmers are also being encouraged to grow cane for the mills. As more scrub and swampland is brought into cultivation, more and more tractors are required. The *Uganda Sugar Factory Ltd.* now has 14 BTD-20 International tractors. These powerful 124-h.p. machines are seldom used in the comparatively small fields of Britain, but they are ideal for the wide open spaces. The company now proposes to bring 10,000 additional acres into cultivation.

Caterpillar Agricultural Tractor

The D4C, the smallest of the track-type tractors produced at the new Glasgow factory of the *Caterpillar Tractor Co. Ltd.*, was shown at Smithfield Show last year, fitted with agricultural tools and equipment. This powerful 65-h.p. machine has already an established reputation for earth-moving operations; now there is a wide range of attachments available for work on the farm and plantation. One of the machines shown had five heavy chisel cultivators mounted on a 'Swing-around' toolbar; the other had a ditcher attached.

Implement Parts

For hard-wearing conditions, farm tools and tractor implement parts have to be made from formula steel of the highest quality, specially hardened, heat-treated and tempered to ensure

D4C Caterpillar tractor with No. 4 toolbar at work in Lincolnshire

long life in all soil conditions. *S. & J. Kitchin Ltd.* are specialists in this field and can supply overseas manufacturers and wholesalers with mechanical hoe blades and cultivator tines of many designs and patterns to meet special requirements; also mouldboard and disk ploughs, coulters and seed-drill disks; chaff-cutting knives and potato-lifting tools; circular and band saws; beater bars and slicer knives; mamotti blades, machetes and parangs.

Multi-tine Cultivator

The 'Superflow', a five-, seven- or nine-tine cultivator recently introduced by *Bomford & Evershed* Ltd., may be used for operations ranging from light cultivation to deep subsoiling; the tines can be adjusted laterally and their number varied from the full complement down to only one, according to the result it is desired to obtain; depth-control wheels can also be provided. There is a shear bolt which gives when a load, caused by hidden obstructions, in excess of 2 tons is applied to the tip of a share. There is also an appreciable weight transfer from the implement to the tractor which will check wheel spin.

Small Power Units

The 'Series 90' engine consists of a basic engine with a number of interchangeable crankcase end covers, which make it possible to adapt it for a variety of uses and enable the unit to work with the crankshaft either in the horizontal or the vertical position. It is an air-cooled 4-stroke, square engine which has recently been developed by *B.S.A. Motor Cycles Ltd.* for incorporating in lawn mowers, pumping units, charging sets, power sprayers and similar equipment.

Motor Accessories

The catalogue of general accessories recently issued by *Romac Industries Ltd.* is being distributed to stockists throughout the world, but it is also obtainable through the Reader Service. Of particular interest to the farmer overseas, who has to do his minor repairs and maintenance and also meet sudden emergencies, are such items as repair kits for rubber boots, tyres and tubes; vulcanising outfits; jointing and soldering materials; wire brushes and sand-blasting gear for metal surfaces; electrical sundries – cable, flex, clips, terminals, hosing and insulating tape; complete spray-painting units; polishes and protective coatings for paints and enamels; anti-freeze mixtures; fire extinguishers and first-aid outfits.

The 'Superflow' has a unique combination of three rows of tines at 30-in. spacing with 24-in. under-frame clearance

Controlled Grazing

In many parts of the world controlled grazing to check the deterioration of pastures through selective grazing and to ensure better management of pastures is still a new idea. While electric fencing would not be a good proposition for pastures under coconuts, owing to the falling fronds, it is to be recommended for open pastures where the cattle need to be directed in their feeding.

'Fencer Accessories' is the title of a useful brochure, offered by *Wolseley Engineering Ltd.*, which describes various alternatives in the way of electric fencers, batteries, mounting posts, insulators and general accessories. It also makes clear what is required for enclosures, ranging from a ¼-acre up to a 4-acre enclosure, and for strip grazing on a 200-yd. front.

Four-wheel Drive

The arrival of 4-wheel drive for agricultural tractors has been strangely delayed, for it was thought of about 25 years ago, but was turned down as an unnecessary complication and expense.

Of all the wastes in mechanised farming, it is possible that wheel spin is the worst, as it wastes fuel and lubricant, causes excessive wear to tyres and may damage the transmission.

Bray Construction Equipment Ltd. have been working for some time on this problem and have now introduced the ' Roadless ' 4WD loader. This is a loading shovel which forms an integral part of the tractor and is not simply a tractor mounting. It has been found that the use of 4-wheel drive gives great adhesion between the ground and the tractor and this makes it possible to use a broader implement and move faster through the elimination of wheel spin.

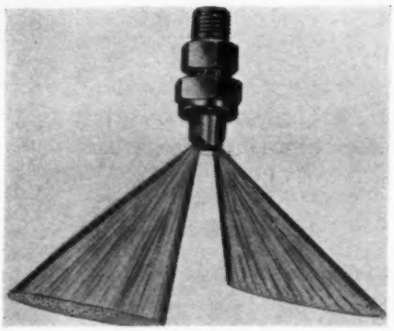
Testing Tractor Plugs

The 'Plug-scope', a new electronic sparking plug tester introduced by the *Champion Sparking Plug Co. Ltd.* at the Commercial Motor Show, is described as 'a cathode ray oscilloscope which employs a transistorised power supply'. In spite of this awesome description, it can be used by any mechanic at a tractor or lorry servicing station after only a few minutes' instruction to determine plug condition.

The instrument is attached by four simple connections to any car, lorry or

tractor petrol engine—one to each of the battery terminals, one to the ignition coil, and the fourth to any one of the sparking plugs. In three minutes or less the operating condition of an entire set of plugs can be determined without removing the plugs.

Basically the instrument measures the voltage required to fire the plugs by means of traces which appear on a 3-in. screen. Traces well below a horizontal warning line inscribed on the screen indicate normal firing voltage at the electrodes and those above indicate that excessive voltage is required. As plugs wear, trace height increases gradually until it passes the red line.



New Spraying Systems twin-tip 'TeeJet' flat spray nozzle

Improved Leaf Coverage

A new 'TeeJet' spray nozzle has been introduced by the *Spraying Systems Co.*, of the U.S.A., for fitting to boom sprayers to give a new method of spraying with thorough and uniform coverage. The nozzle gives two flat sprays, which are separated by an angle of 60°; the jet projecting forward gives a thorough coverage to the leaves as the plant is approached and that projecting backwards provides similar coverage after the plant has been passed over. In addition, the tapered edges of each jet ensures uniform distribution over the whole of the area covered by a boom carrying a number of these jets. The coverage rates range from 3.2 to 7.4 gal. per acre, depending on the tractor speed and the pressure.

Mobile Working Platform

The *Thames Packaging Equipment Co.* have recently introduced a sturdy, self-propelled mobile lift which can hoist a man to a height of 25 ft. in a few seconds. The operator on his working platform has complete control and can make the lift rise or descend by a touch of the control lever; the machine may also be moved on site forward or backward, or it may be turned. The necessary power is produced by a single-cylinder petrol engine, which operates an air compressor. For movement from site to site the 'Mobiliftor' can be towed by a lorry, tractor or cross-country vehicle or it can be moved for short distances under its own power.

The makers claim low running and maintenance costs, and on the farm, orchard or plantation it would have many uses—for instance, erecting power and telephone lines, farm building and painting operations, or for tree pruning and spraying, artificial pollination operations and fruit harvesting. Bunches of oil palm fruits which require careful handling to prevent bruising could be collected with this machine.

Angled Hedgecutter

A long-arm, any-angle hedgecutter was shown by *R. J. Fleming Ltd.* at the Smithfield Show which can be attached to any make of front-, rear- or mid-mounted loader, mounted on any make of tractor fitted with p.t.-o. The power required is approximately 15–20 h.p. and this is obtained from a hydraulic motor which is attached to the beam immediately over the rotary saw. The reach from the tractor wheels to the extreme end of the cutter can be varied from 5 ft. 6 in. to about 12 ft. and the implement may be used for topping, siding or angle siding hedges, for cutting kale, or for trimming the sides of ditches.

Mechanical Scythe

Ample power for propulsion and to give an effective 26-in. cut is provided by the *Villiers* 4-stroke, 256-c.c. engine, which is fitted to the *Hayter* self-propelled scythe. It is a robust and easily manoeuvrable machine, which can rapidly deal with a heavy overgrowth of rough grass and weeds and reduce it to a fine cut. The vegetation is chopped and spread as a green manure or mulch over the sward. Easy adjustment for height of cut from ground level to 6 in. is provided through a quick-release, lever-operated cam.

Self-propelling and self-lifting 'Mobiliftor' in the extended position

The engine is fitted with a centrifugal clutch and a chain-driven, 3-speed gearbox, giving different forward speeds to suit varying conditions. The machine can draw a trailer seat, mounted on a roller or on wheels, and there are also special attachments, such as a 400-w. generator, a gear pump and spray unit, and a centrifugal pump, which are optional extras.

Interlocking Stencils

Stencils are an indispensable requirement for any farmer and planter who has to mark bags, cases or crates for shipment or transport to market. *Heller & Sons (Engineers) Ltd.* produce stencil plates of individual numbers or letters, made in stout gauge zinc, which can be interlocked to form words or a series of numbers in a straight line and with equal spacing. Soft-coloured inks and brushes for use with the stencils are supplied with the standard sets of 44 pieces, including alphabet, figures, stop, comma and spaces. These are available in sizes ranging from ¼–4 in. and, of course, extra letters or numbers can be supplied.

Hard-working Tractors

The Sudan Gezira Board, which operates the world's largest tenant farming development project, has just

placed a contract for the supply of tractors.

When the question of providing machines for the 2-million-acre cotton growing scheme arose, the Gezira Board held performance trials open to all comers and selected the 50-h.p. *Massey-Ferguson* '65' on its performance.

The requirements were severe, as each tractor will have to work a 3,000-hour year, which is three times as much as a tractor farms in Europe.

Non-clogging Spray Gun

A problem frequently met in spray painting is that of feeding to the spray gun a material which is heavily pigmented and which readily settles out when not being used. The material, after leaving the pressure container, may settle out in the hose, and spraying cannot be resumed without considerable waste of time and filler.

Alfred Bullows & Sons Ltd. now offer a solution to this problem. The 'Pogo' pump will feed the material through a standard fluid hose to the spray gun, to which is attached a 'Y' piece. From this 'Y' piece a second length of hose provides a return flow to the pump and hence to the container of material, which is itself kept agitated by this constant flow and return of material. With this simple arrangement it is possible to use the spray gun at any time without any stoppages at all.

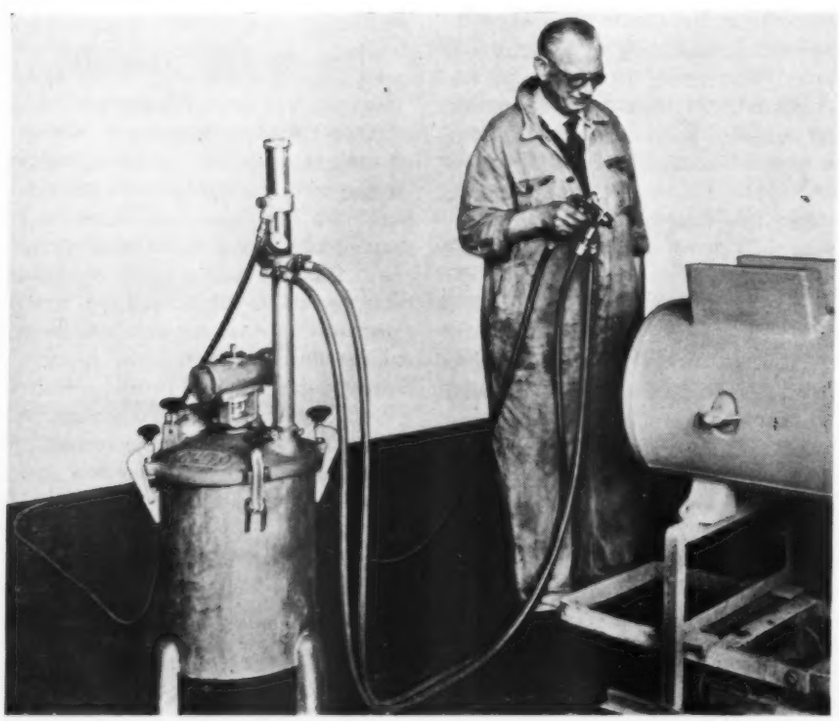
Protection Against Spray

The 'Clearways' face shield, which is offered by *Safety Products Ltd.*, provides operator protection against possible hazards in the preparation of spray liquids. It consists of a headband and brow guard with a detachable flip-up visor; it fits lightly and comfortably on the head, so giving no distracting pressure or tension. The tough plastic brow guard is made of coloured 'Celastoid' and the visors of clear non-inflammable 'Celastoid' have rigid aluminium edge binding to give strength. The shield may be worn over ordinary spectacles.

Revolutionary 4-wheel Drive

The 'Manuel' 4-wheel drive tractor conversion unit, consists of a power transfer box, a propellor shaft connecting to the front axle, complete with universal joints, radius rods and special hubs, wheels and tyres. The idea is that this will give added adhesion and greater pulling power and so better performance in sticky and muddy conditions, on broken ground, on steep slopes and on logging tracks. With less wheel spin there will be less tyre wear and reduced fuel consumption. It is already being claimed that this device, which is manufactured by *Selene* of Italy, will improve the drawbar pull by up to 100% in the worst conditions.

The 'Clearways' face shield with a section of self-adhesive urethea to replace the usual sweat-band which is uncomfortable and unhygienic



Pump and spray gun by Alfred Bullows. Note the second length of hose which provides a return flow to the pump

Two New Sprayers

The 'Micronette Mk 11'—a knapsack or monowheel sprayer—and the 'Micron Mantis'—a tractor-mounted rotary sprayer, were two entirely new machines introduced by *Micron Sprayers Ltd.* at Smithfield. A fuller account will be published in a later issue.

Reader Service

For further information on any item reviewed in this issue please use the card provided or write to:

Reader Service
WORLD CROPS,
Leonard Hill House,
Eden Street, London, N.W.1,
England

Agricultural Chemicals, Seeds and Supplies

Biological Control

Nutrilite Products Inc. and *Pennsalt Chemicals Corpn.*, of U.S.A., have announced that they will shortly be jointly engaged in the manufacture and marketing of biological insect control products now that the U.S. Department of Agriculture has registered 'Biotrol', a formulation containing *Bacillus thuringensis* as its active ingredient. This product has been registered for the control of cabbage worm, cabbage looper, artichoke plume moth and tobacco hornworm on broccoli, cabbage, cauliflower, celery, lettuce, potatoes, artichoke and tobacco (see also WORLD CROPS, 1960, **12**, 425).

Rice Leafhoppers

According to a report issued by the *Union Carbide International Co.*, of U.S.A., 'Sevin' insecticide has given better control of the rice leafhopper, *Nephotettix cincticepus*, than the standard method using malathion in laboratory tests recently carried out by the *Mikasa Kagaku Kogyo Co.* of Japan.

The technique used was to spray the chemicals on adult female leafhoppers feeding on pot plants in cylindrical wire cages and count the number of dead insects each day.

A mixture of .05% wettable powder form of 'Sevin' insecticide and .0005% pinamin killed half the insects within 5.7 hours; a .05% malathion emulsion required 9.6 hours. Eight days after treatment the first combination had given 97% control, while the malathion combination was only 31% effective.

Product Handbook

In accordance with the company's policy of making regular revisions of their product recommendations, *Plant Protection Ltd.* have rewritten a number of pages of their product handbook. These revisions concern 'Agrocide 26 DP', 'Gammexane A', 'Gammexane 20', 'Gammexane 26 DP', 'Gammexane 50 DP' and the 'Gammexane' smoke generators. The dosage rates recommended against pests of importance to public health have, in some cases, been altered to bring them into line with the recommendations for BHC and gamma-BHC made by the World Health Organisation.

Sodium for Cattle

Estimates of the sodium requirement of dairy cattle are about 5-10 g. of sodium per animal per day for maintenance, plus about 15 g. for milk production. The total requirement is therefore about 23 g. per day. With a daily intake of pasture grass containing 15 kg. of dry matter, the sodium content of this dry matter should be 0.15%; in the case of watery young pasture grass, the intake of dry matter may be very much less, perhaps only 10 kg. of dry matter, in which case the animal would not get sufficient sodium.

Recent research also suggests that sodium deficiency in grass is much more widespread than has been supposed, particularly on the sandy soils of Holland, and that the sodium in the dry matter is often less than 0.15%. A recent paper issued by the *Nitrate Corporation of Chile* suggests that the sodium content of the leys can be increased by a judicious selection of the grass mixture to be sown and by the inclusion of Chilean nitrate of soda in the fertiliser treatment.

The Foliage Insecticide

This is the title of an attractive brochure, recently published by the *Shell Chemical Co.*, which can be obtained through our Reader Service. It describes the uses of their product endrin as an all-purpose insecticide for the foliage pests that afflict coffee, cocoa, cotton, maize, sugar-cane, rice, tobacco, forest trees, orchards and grasslands.

Endrin is a chlorinated hydrocarbon* which is used as a contact and stomach poison for killing caterpillars and the control of aphids and such pests as beetles, frog-hoppers, leaf miners, plant bugs, sawflies and thrips.

When applied to foliage it persists for a period of 10-20 days, depending on the amount of endrin deposited and the weather conditions. So long as any endrin is present on the foliage, insects which alight on, crawl over or eat the treated parts will quickly die, it is claimed.

Experiments to discover whether this chemical affects plant growth have shown that there is no risk of damage if correctly formulated material is used at the recommended dosage rate. It is further stated that its use does not cause off-flavours in the crops to which it is applied, nor in the case of tobacco is there any change in the smoking quality.

* See WORLD CROPS, 1960, **12**, 358.

Nylon in Agriculture

Many farms in Britain are today using nylon-reinforced sheets for the protection of hay ricks and stacked produce, such as sugar-beet. Protective suits and headgear made of this material are also used for crop spraying.

This material is immensely strong and is also resistant to most acids and chemicals; it is much lighter and easier to store than tarpaulins and it will not rot even when it is folded and stored in a damp condition, according to the manufacturers, *Northide Ltd.*, who produce protective clothing and gloves, and also lightweight sheeting for covering hay and straw.

Cutting Evaporation Losses

A new system for applying cetyl alcohol, known as the 'Constant Feed Dispenser', has been developed by *Price's (Bromborough) Ltd.* for conserving water in small reservoirs and water holes. It is claimed that it automatically provides an effective film on water surfaces up to ¼ acre in extent for a period of one month (see WORLD CROPS, 1957, **9**, 250, and 1959, **11**, 203).

Wild Oat Control

Fisons Pest Control Ltd. recently announced that after two years of intensive work a new selective weedkiller, 'Carbyne', can be made available to British farmers for the control of wild oats in cereals. The most important point about this new herbicide is that it need not be applied until the weed has been actually observed.

The most important factor in its use is correct timing: it must be applied when the majority of the wild oats present in the crop are between the 1-2½ leaf stage; the stage of the crop itself has been found to be unimportant. Two pints of 'Carbyne' are required per acre and the best results are obtained when the material is applied at from 10-20 gal. per acre.

This treatment, it is claimed, will stunt the growth of the majority of wild oats present with the cereal crop and, to be more precise, all varieties of wheat and 24 named varieties of barley. The new weedkiller is stated to be of low toxicity, leaving no harmful residues on the harvested crop.

By stunting the growth of the weed seedlings the crop seedlings can receive more light, air and moisture and the result is higher yields, but naturally these vary according to the conditions. Yield increases as high as 16 cwt. per acre have been recorded, and for all the trials during the past year the overall average was 4 cwt. per acre.

Granular Fertilisers

There are already various processes which, by decomposing rock phosphate with the aid of nitric acid, make it possible to manufacture large quantities of nitrogen-phosphorus fertilisers at relatively low prices. Potash, if required, can be added. One great disadvantage of these mixtures, however, is that they contain only a small percentage of water-soluble phosphate (25-30%).

Granular compound fertilisers, in particular, must contain a high percentage of water-soluble phosphate in order to obtain the maximum response. Trials carried out in various countries have shown that on acid soils at least 40%, and on basic soils 60-70%, of the phosphate should be water-soluble. The yields which are then obtained can in most cases stand comparison with those from fields fertilised with 100% water-soluble phosphates.

A process has been evolved by *Albatros Superfosfaatfabrieken N.V.* whereby a high percentage of water-soluble phosphate is produced by using a mixture of acids—nitric, phosphoric and sulphuric—for the decomposition of the rock phosphate. Production costs are reduced by decomposing the mineral, compounding the various plant nutrients (including magnesium and trace elements if required) and granulating the final product in one continuous process. The final product is offered in the form of round, brown pellets 1-3 mm. in dia.

Reader Service

For further information on any item reviewed in this issue please use the card provided or write to:

Reader Service,
WORLD CROPS,
Leonard Hill House,
Eden Street, London, N.W.1,
England

Weeds in Sugar-beet

For some years now there has been a search for a safe selective weedkiller to use with sugar-beet. The *Murphy Chemical Co. Ltd.* are now able to announce that their latest product, 'Murbetex', will control weeds in sugar-beet without harming the beet seedlings. They propose to market the product on a small scale this year, limiting the acreage to be treated by any one farmer to 10 acres with band-spraying or to 1 acre with overall-spraying.

The new formulation contains disodium endothal and propham. Endothal has already been used for several years as a partial controller of weeds in sugar-beet, but to obtain better control of certain annual weeds, such as meadow grass, wild oats, chickweed and spurry, it has been found necessary to add propham. The new compound weedkiller persists actively in the soil for six weeks after application and gives weed-free rows throughout the singling period, *i.e.* five to eight weeks after planting.

It has been found that a moderate rainfall within two to three weeks after application is required, as some soil moisture is necessary for its proper functioning. The new formulation is being recommended for use on light and medium soils, but not for heavy or for fen-type soils. Heavier soils with a higher clay content tend to inactivate the herbicide mixture, possibly, it is suggested, by absorption in the clay fraction, and soils with a high organic content inactivate the weedkiller even more.

The main purpose is towards the total mechanisation of the crop, as weed-free rows do away with the need for careful hoeing and allows speedier work with the tractor, down-the-row thinning is made easier by the absence of weeds and weed-free rows mean easier mechanical harvesting.

Trouble-free Watering

'Supplex' sprinkler hose would appear to be the answer for trouble-free watering on the cricket pitch or tennis court, in the market garden and greenhouse, and on experimental plots and in the slatted orchid houses of the tropics, for it produces a soft, misty spray of uniform pattern with a span of up to 20 ft. (according to the water pressure) without flooding or destroying surface tilth.

It is a triple hose of amalgamated plastic material, which is perforated so as to angle the spray evenly, and the underside is ribbed so that the water line will not 'snake' or move in use. This new type of hose, with special unions for ½-in. or ¾-in. taps, is offered by *F. W. Berk & Co. Ltd.*, who describe it as being robust and durable and state that if it should be torn accidentally it can be repaired at small cost.

Honour for Hawaii and Alaska

A new American hybrid marigold—to be introduced by the *W. Atlee Burpee Co.* in 1961—has odourless foliage, long stems and delicately honey-scented flowers of a rich orange colour. It is to be known as the 'Hawaii' marigold in honour of the first anniversary of Hawaii as the 50th state of the U.S.A.

Another, a big yellow bloom, is to be known as the 'Alaska' marigold in honour of the 49th state.

World Crop Reports

INTERNATIONAL REPORTS

Cocoa beans

A first estimate of the 1960-61 world cocoa bean production is 2,178 million lb., the second largest crop on record and only 1.5% below the 1959-60 production.

North America

The 1960-61 North American cocoa crop is estimated at 187.2 million lb., compared to a 1959-60 crop of 191.1 million. Several countries are expecting slightly smaller crops this year, with the biggest decline in the Dominican Republic.

The 1960-61 cocoa crop in *Costa Rica* will probably be below 1959-60, as heavy rains during July and August damaged the crop in the Limon and Sixaola areas.

Cuba's 1960-61 production is estimated at 6 million lb. The 1959-60 crop amounted to 6.3 million lb., as weather conditions were very favourable and new plantings came into bearing. The 1960-61 crop in the *Dominican Republic* is not expected to be quite as large as the 85 million lb. crop of 1959-60. The Dominican Republic is by far the largest producer in North America.

Mexico will probably have a very slight increase in production for the 1960-61 season. *Panama's* 1960-61 crop is estimated at 4 million lb., with all of the commercial production centred in Bocas del Toro Province.

South America

South American 1960-61 cocoa bean output is estimated at 528 million lb., or slightly below 1959-60. Practically all of the decline will be in Brazil, with increases expected in most other countries. Strong winds and heavy rains during the middle part of 1960 reduced the Brazilian main crop (October-April), but were expected to have little effect on the 1961 Temporao* crop. While the 1960 Temporao crop was below early estimates in size, the quality was not affected by the unfavourable weather, according to reports. The quality of the 1960-61 main crop may be off, as picking and fermentation has been done early in order to avoid brown pod rot.

Scene on a cocoa farm at Tafo, Ghana. After the pods have been cut from the trees they are split open and the wet beans extracted. The beans can be seen in the basket in the foreground

Colombia's 1960-61 production is estimated at 33 million lb., 5% above 1959-60. Indications are that, despite the rising domestic production, Colombia will need to import about 15 million lb. of cocoa annually for the next few years. The Government, through its recently inaugurated Cocoa Development Campaign, is trying to increase production through research, multiplication of superior clones and technical assistance. During the January-August period of 1960 the National Cocoa Campaign distributed 400,000 seedlings produced in the Department of Huila.

Ecuador's production is expected to rise in 1960-61, as approximately 2 million trees came into production in 1960 and witch's broom disease has been on the decline during recent years. Monilia pod rot, however, continues to cause much loss.

The planted acreage and production of cocoa are increasing rapidly in *Peru*. Production has doubled in the last decade and the main commercial growing areas are in the Departments of Cajamarca, Amazonas and Cuzco.

There has been little change in *Venezuelan* production during the past few years. While the cocoa programme is producing about 450,000 plants per year it is doubtful if these will do much more than maintain production.

Africa

Total 1960-61 cocoa bean production in Africa is now estimated at 1,413 million lb., slightly below the record crop of 1959-60.

Production in the *Cameroons* is estimated to be slightly higher than in 1959-60, due to good weather and new plantations coming into production. Despite good soils and climatic conditions, the yield per hectare and per tree in the Cameroons remain among the lowest of the cocoa-producing countries.

A rigid spraying programme and good weather are factors in the outlook for another large crop in *Ghana*. There are reported to be sufficient small pods on the trees to carry harvest of the main crop through February 1961.

The 1960-61 cocoa crop in the *Ivory Coast* is estimated at 133 million lb., compared with 128 million in 1959-60. *Togo's* 1960-61 production is estimated at 17 million lb., while *Fernado Po* and *Rio Muni* production is expected to amount to 50 million lb., and a 20 million lb. crop is forecast for *Sao Thome* and *Principe*.

Nigeria's 1960-61 cocoa bean crop, estimated at 325 million lb., is almost equal to the very large 1959-60 crop. Weather has been favourable for the crop, but the final harvest will depend to a large extent on the continuation of spray programmes.

Asia and Oceania

The 1960-61 cocoa bean production in Asia and Oceania is estimated at 49.5 million lb., up 13.5% from the 43.6 million lb. in 1959-60.

Most of the producing countries are increasing their production and it is forecast that *New Guinea* and *Papua* will this year surpass the increased production of *Western Samoa*. Production is rising rapidly in the *Philippines*, as many young trees are just beginning to bear. Total area devoted to cocoa in the Philippines is now about 42,000 acres.

* Early or first crop, 1 May-30 September; after that comes the main crop. There is no difference in quality.

India

The 1959-60 *tobacco* crop is placed at 629 million lb., according to the final official estimate of the Indian Ministry of Food and Agriculture. This is 7.7% above the previous year's crop. Acreage was up 4.1% from 1958-59.

Flue-cured production totalled 139 million lb. in 1959-60—a little more than last year. Most flue-cured is grown in the state of Andhra Pradesh and the remainder in Mysore. India is one of the world's largest exporters of flue-cured tobacco, following the U.S.A. and the Federation of Rhodesia and Nyasaland.

The 1960 commercial *walnut* crop is estimated tentatively at 10,000 short tons, in-shell. This is larger than the short 1959 crop, now estimated at 8,500 short tons, but smaller than the 1954-58 average of 10,800 tons.

The 1960-61 *cotton* crop in India is now estimated at 4 million bales (500 lb. gross), 21% higher than the 3.3 million bales produced in the previous season. The increase is attributed mainly to a return to more nearly normal yields than in 1959-60, when flood damage in the state of Bombay and other areas sharply reduced yields. The area planted to cotton this season is over 19 million acres, slightly less than in 1959-60.

Australia

Australian production of flue-cured *tobacco* in 1959-60 reached the record level of 20.3 million lb.—45% higher than the 14 million produced in 1958-59.

For the 1960-61 season a further substantial increase in production is expected. Indications are that the area planted this season may be as much as 25% larger than the 19,600 acres devoted to tobacco in 1959-60. Excellent yields and prices obtained for the 1959-60 harvest have greatly encouraged interest in the crop. New curing barns are being built in all producing areas.

Japan

Japan's 1960 *rice* crop is estimated at a record 12.9 million m. tons of brown rice. The previous largest crop was 12.5 million m. tons harvested a year ago. If weather continues favourable, it was forecast that the new harvest might exceed 13 million m. tons.

The acreage planted is about the same as last year. The following new methods have contributed to increases in average yields per acre in recent years: nurseries for raising rice seedlings have been improved; plastic film, paper or glass to cover seedbeds have been generally adopted; in some places an increase in the number of plants per unit of area has been practised; increased fertiliser has been applied to suit local soil and climate; and in areas where the season is shorter new early-maturing varieties have been adopted.

Rumania

Rumania's 1960 *sunflower seed* crop is unofficially estimated at about 530,000 short tons from 1.3 million acres, compared with official estimates of a record crop of 583,000 tons in 1959.

Sunflower seed production has shown a marked increase in recent years from the 280,000 tons produced from 700,000 acres in 1957. The crop of 1959 was reported to be large enough to meet the country's requirements for edible oil.

Soya bean acreage, which was reduced from 74,000 acres in 1956 to 30,000 in 1958, then increased to 56,000 in 1959, was reported to be increased again in 1960 possibly to about 75,000 acres. Some 235,000 bushels were produced in 1958.

Pakistan

Pakistan's 1960 crop of flue-cured *tobacco* totalled 23 million lb., about one-third larger than the previous harvest. A small further rise is forecast for the 1961 crop. Favourable growing conditions, larger acreages and increased demand by cigarette manufacturers account for the increase in production.

West Germany

A severe blue mould attack in West German *tobacco* fields sharply reduced both yield and quality of the 1960 crop. The total harvest will not be more than 18 million lb., with much poor-quality leaf. (In 1959 the crop amounted to about 42 million lb.)

The cigar leaf crop, as well as the flue-cured, suffered extensively, but to a lesser extent than burley. The greatest relative damage apparently was in the burley area. Estimates place the burley crop this year at 3.6 million lb., with much of it unsuitable for normal uses. In 1959 the burley harvest was nearly 13 million lb.

England and Wales

Conditions were unfavourable for autumn cultivations during November and, although some ploughing was possible, little progress was made and work was much less forward than usual. Very little drilling was possible during the month and seedbeds were poor in many areas.

Early-sown *wheat* looked well on the whole, but later sowings were slow to germinate. Some slug damage was reported from several areas and many crops were patchy due to waterlogging. The small acreage of *barley* was generally satisfactory. Apart from some damage caused by waterlogging, *oats* on the whole appeared promising. The small acreage of *rye* was satisfactory. Where germination had taken place *beans for stockfeeding* appeared to be healthy.

In most seasons, potato lifting is practically completed by 1 December, but in 1960 it was estimated that only about 80% of the crop had been harvested; some unharvested crops were rotting in the ground. Lifting was carried out under very wet conditions and the keeping quality of the crop was likely to be affected. The proportion of tubers affected by blight varied greatly. Potatoes in clamp and store appeared to be keeping reasonably well, but some rotting was reported.

Conditions were very unfavourable for the harvesting of *sugar-beet* and progress was slow; unharvested crops were still gaining weight. On the whole roots were in satisfactory condition; dirt tares were high in most districts. *Mangolds* generally were a good crop. Muddy conditions were unfavourable for lifting and harvesting was delayed; carting was difficult. *Turnips* and *swedes* grew well and on the whole were a healthy crop. *Kale* was an excellent crop, but utilisation was difficult because of wet soil conditions.

Acknowledgment is made to *For. Crops. & Mark.* for much of the information contained in the above reports.